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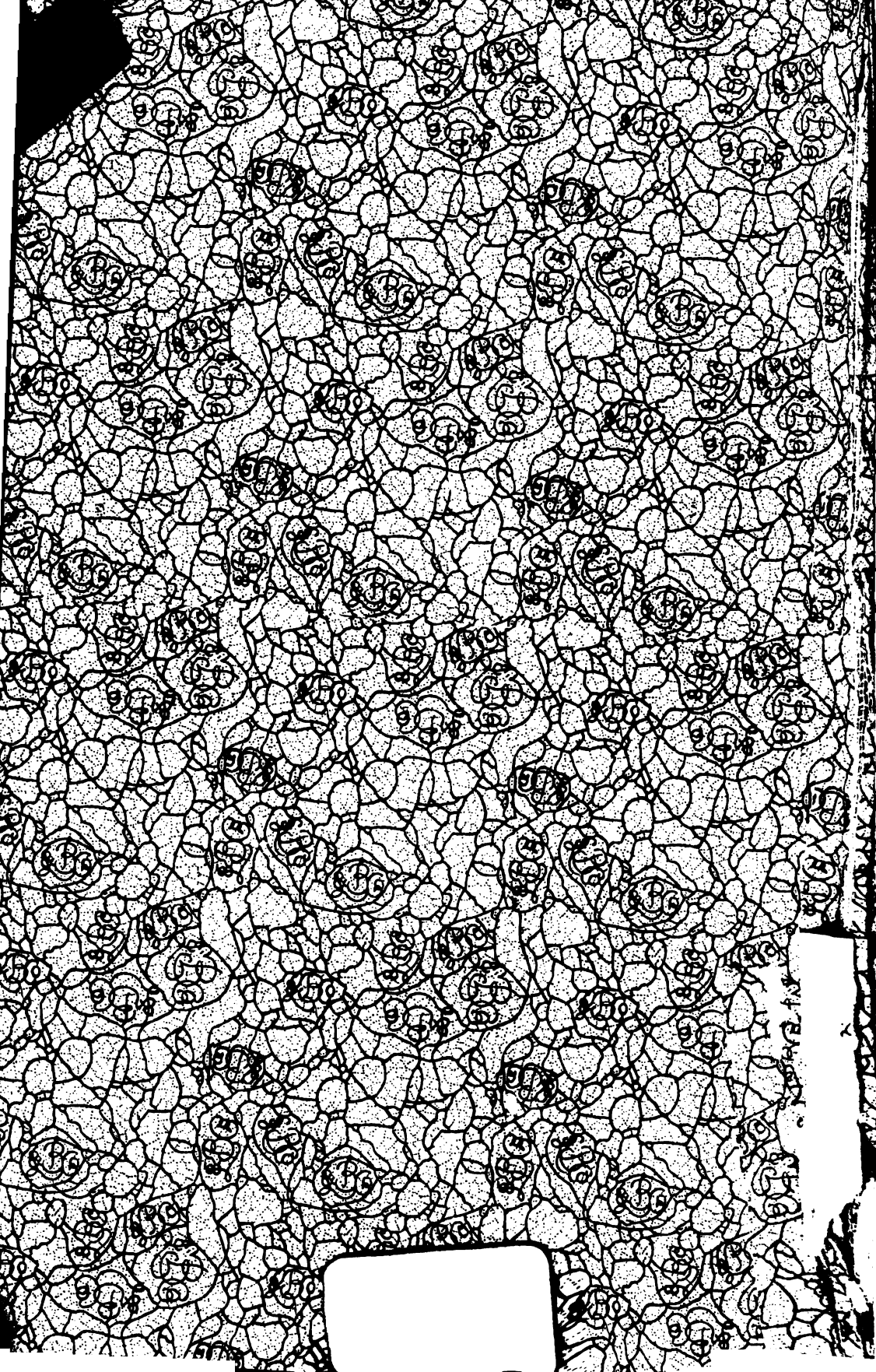
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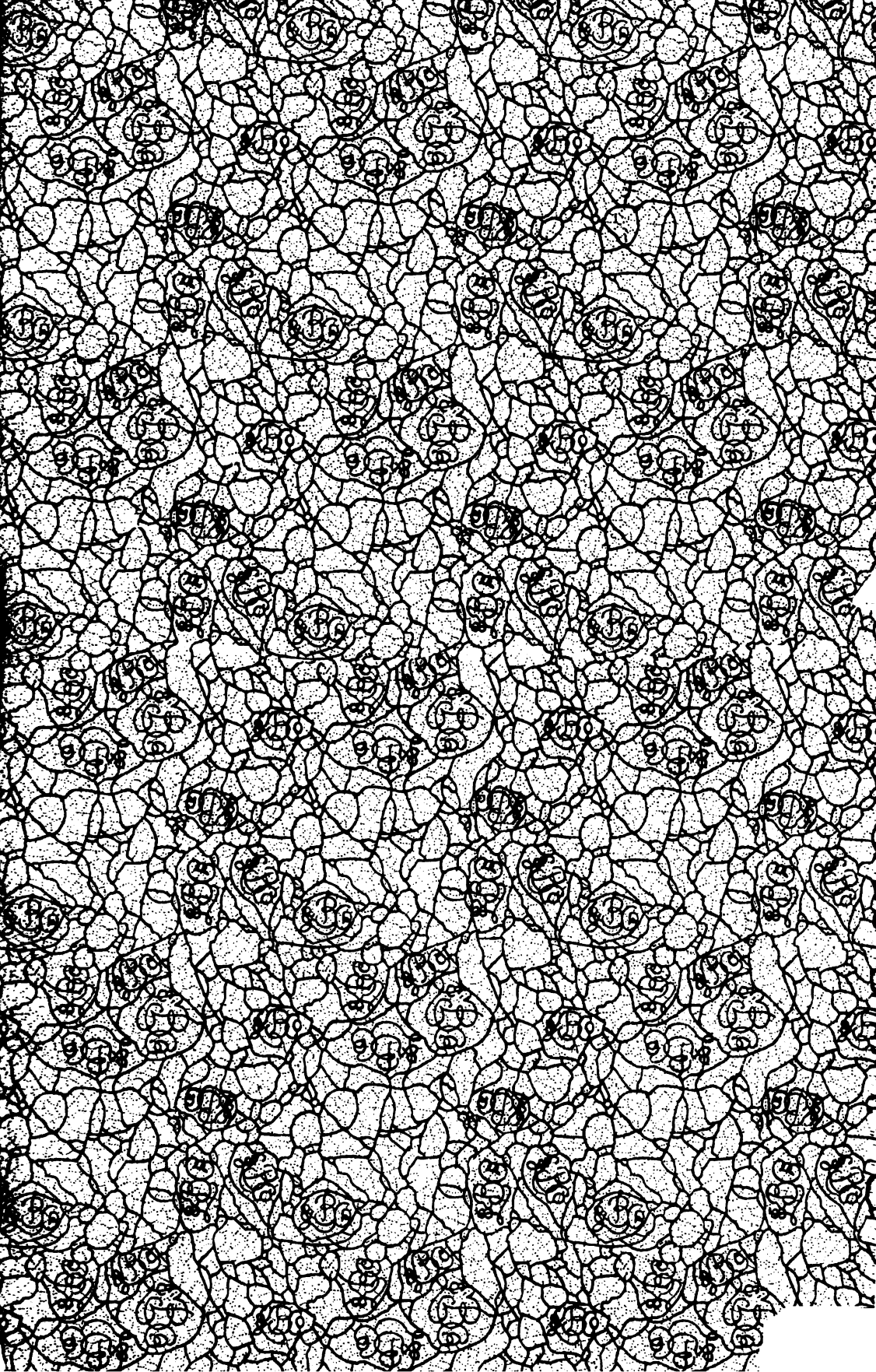
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PROGRESSIVE MEDICINE.

A QUARTERLY DIGEST OF ADVANCES, DISCOVERIES,
AND IMPROVEMENTS

IN THE

MEDICAL AND SURGICAL SCIENCES.

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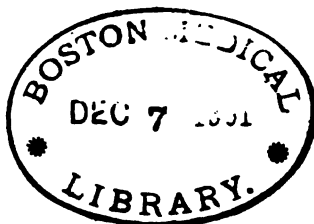
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SURGERY OF THE ABDOMEN, INCLUDING HERNIA—GYNECOLOGY—
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AND LYMPHATIC SYSTEM. METABOLIC
DISEASES—OPHTHALMOLOGY.



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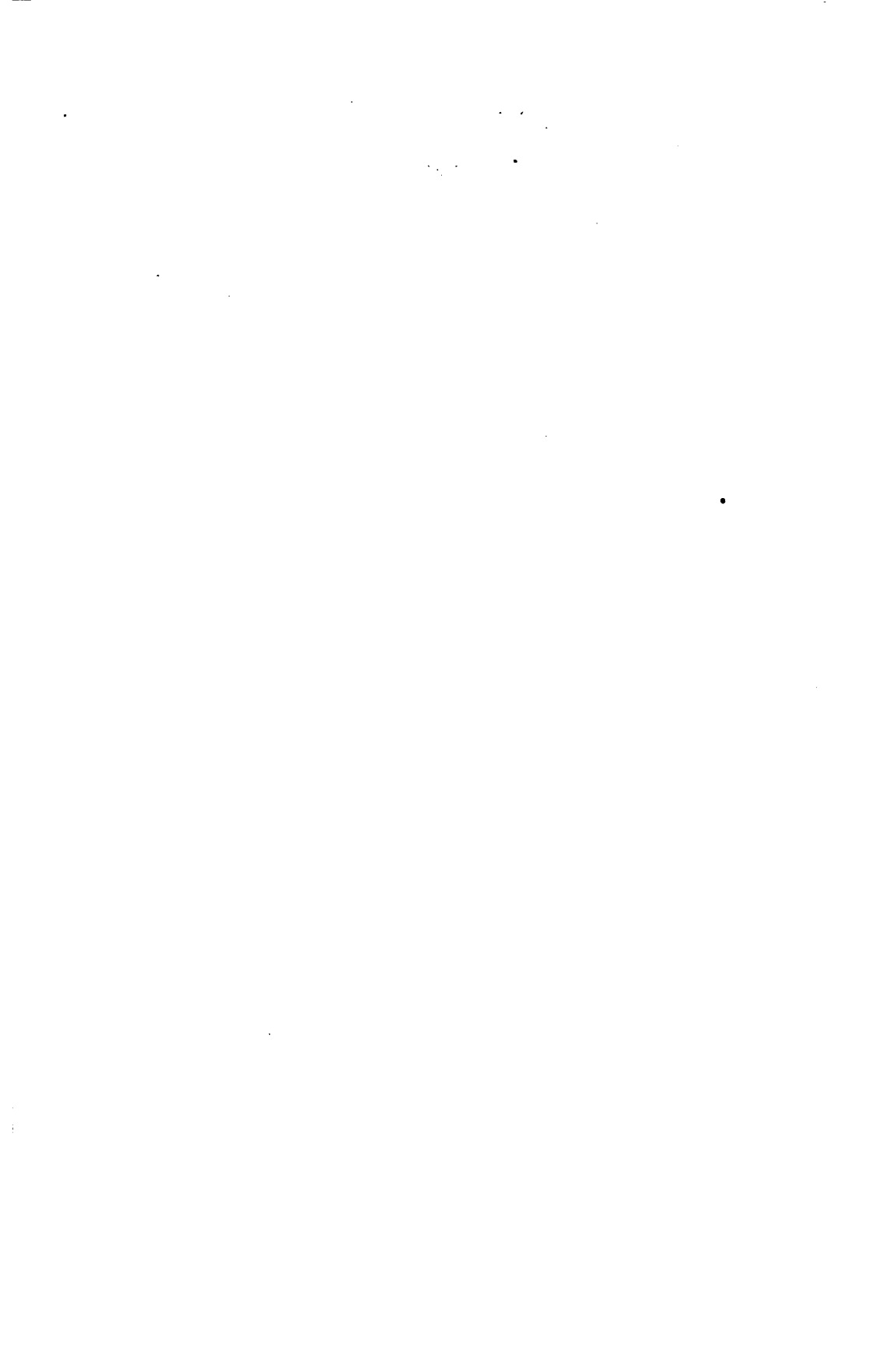
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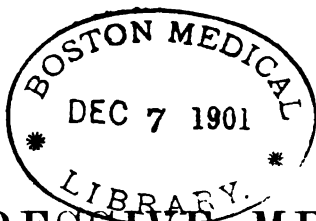
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PROGRESSIVE MEDICINE.

JUNE, 1901.

SURGERY OF THE ABDOMEN, INCLUDING HERNIA.

By WILLIAM B. COLEY, M.D.

IN addition to a general review of the most important work done in the field of abdominal surgery I have tried each year to devote special attention to one particular department. This year I have chosen the surgical treatment of malignant diseases of the intestines and rectum.

THE RADICAL CURE OF LARGE UMBILICAL HERNIA.

NEW METHODS. Considering the enormous improvement in methods and results as regards the cure of inguinal and femoral hernia during the past decade, the results of operation for the cure of large umbilical hernia have proved most unsatisfactory; so unsatisfactory, in fact, that conservative surgeons have hesitated to recommend operative treatment in these cases.

Although the methods of closing the abdominal wall in umbilical hernia have been numerous and varied, the subject seems to have received unusual attention during the past year from both American and European surgeons. Two methods have been proposed which are worthy of discussion. Whether or not they will prove valuable additions to our present limited means of treating this distressing condition time and further experience alone can decide. The first of these methods has been termed the transplanting or overlapping of the recti muscles. Curiously enough, this method seems to have been independently evolved during the past year by three different surgeons—Piccoli, Sapiejko, and Blake, of New York. The most complete description of the operation is that of Sapiejko.¹ The author calls attention to the

¹ Revue de Chirurgie, February, 1900, p. 241.

frequency of acquired umbilical hernia, and states that in 606 cases of acquired umbilical hernia at the Central Bureau of Statistics, collected from the hospitals of Paris, 124 occurred in men and 482 in women—a proportion of about 1 to 4. In the great majority of these cases the predisposing causes of this condition were repeated confinements and marked obesity.

At the Hospital for Ruptured and Crippled, New York, the average number of cases of umbilical hernia treated annually is slightly above 400, but the relative proportion of males to females has been considerably in excess of that observed in Paris. Thus, for example, in the year 1897 there were 409 cases of umbilical hernia, of which 154 were male and 255 female. In the year 1898 there were 413 cases of umbilical hernia, of which 177 were male and 236 female.

An examination of the ages of the patients is of very great interest and importance. Of the 409 cases observed during 1897, 187 were under the age of fourteen, but 4 cases were observed between the ages of fourteen and twenty-one, while 218 were upward of twenty-one years of age. In 1898, of 413 patients observed 245 were under fourteen and 165 over twenty-one. As a matter of fact very few patients have umbilical hernia between the ages of twenty-one and thirty, so that it can be said that umbilical hernia in the majority of cases occurs either before fourteen or after the age of thirty.

Most surgical writers and teachers recognize the fact that operative interference is rarely called for in umbilical hernia under the age of fourteen, inasmuch as nearly all of the patients are cured by mechanical means. It would be interesting to know how many of the cases of adult hernia had a small umbilical hernia in infancy or childhood. This question is a very difficult one to answer, and up to the present time few if any data are available.

The treatment of large umbilical hernia in the female by means of bandages, no matter how skilfully made or carefully worn, seldom prevents the hernia from increasing in size, and all that can be hoped for is to retard this increase as much as possible. The usual history is that after a longer or shorter interval a portion of the contents of the sac, generally omentum, becomes adherent and irreducible. From this time on the hernia increases more rapidly in size and causes much more pain and annoyance.

Admitting, as we must, the impossibility of either curing the condition by means of support or of rendering the patient free from pain and discomfort, we should certainly welcome any new method of operation that offers a fair chance of effecting a cure. Sapiejko gives a very graphic account of the progress of the hernia if left untreated or treated by the ordinary support. He calls attention to the irritation caused

by the adherent omentum, the atony of the intestinal tract, meteorism, increased intra-abdominal pressure, and grave digestive disturbances. The more serious condition of strangulation is worthy of attention, since if the danger of strangulation can be shown to be equal to or exceeding the risk of operation in these cases this would be an important argument in favor of interference.

The mortality of operations performed for umbilical hernia during strangulation is exceedingly high, and although the statistics of Hiller and Schmidt and Hertel place it as low as 27 per cent., I believe more complete statistics would give an actual mortality not far from 50 per cent.

In order to establish the frequency of strangulation in umbilical hernia Sapiejko cites the statistics of Berger, which show that of a total of 10,000 herniæ 606 were umbilical, and of 100 cases of strangulated hernia 6 were umbilical, thus showing that strangulation occurs practically with the same frequency in umbilical hernia as in the other varieties.

The operative technique followed by Terrier, Czerny, Reverdin, and other surgeons was to remove the hernial sac, resect the omentum, reduce the contents, suture the borders of the hernial ring in layers, and finally to close the skin by a separate layer of sutures. The results of this method have not been satisfactory.

Condamin¹ introduced two original ideas in the technique of the operation to facilitate the extirpation of the hernia and the resection of the sac. He opened the abdominal wall at the periphery of the hernia and continued the incision until the peritoneal cavity was reached. Thus the sac, superfluous skin, and umbilicus were removed in one portion; omphalectomy, and closure of the wound in separate layers, as in ordinary laparotomy, constituted the second original idea.

Gersuny introduced the idea of dissecting free the edges of the recti muscles, uniting them by suture. The wound of the skin was tamponaded with gauze and allowed to remain open for a few days, then closed by superficial sutures. This latter step was taken to avoid the subcutaneous suppuration which had frequently been the cause of trouble.

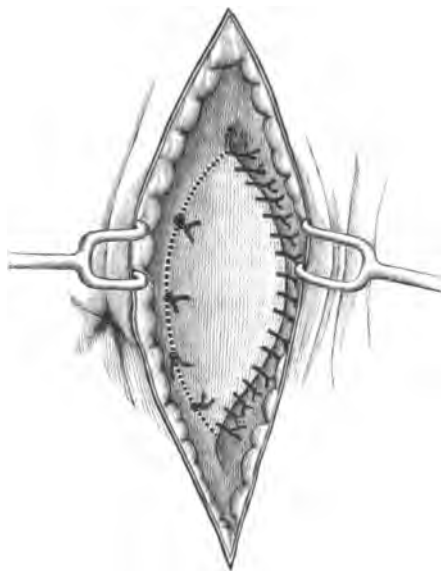
Championnière, whose experience in the operative treatment of umbilical hernia has been considerable, sutures the edges of the aponeurosis of the peritoneum and places a second and sometimes a third row of sutures in the aponeurosis, somewhat after the manner employed by Lambert in the peritoneum—superposition of rows of sutures. Championnière's opinion is that in small herniæ in which the borders of the recti muscles are but little separated every operation after the newer

¹ Arch. Prov. de Chir., Paris, 1892, p. 395.

methods gives good results, but in voluminous herniæ with a large separation of the recti muscles there is at present no method that can be relied upon to give satisfactory results.

The new method advocated by Sapiejko is practically identical with that described by Piccoli and Blake, and the technique is easily understood by referring to Fig. 1. The first step of the operation—the removal of the superfluous skin, umbilicus, and sac, and adherent omentum, if necessary—is practically the same as in the operation of Gersuny, Condamin, and others. The rectus muscle on either side is then freed from the overlying fat for a distance of two to three inches ;

FIG. 1.



Operation for umbilical hernia. (PICCOLI.)

then the two muscles are made to overlap, the dorsal portion of the left muscle being sutured to the ventral portion of the right, and *vice versa*. The method is so simple that detailed explanation of the technique is hardly necessary, inasmuch as the illustrations are so clear.

Radical Treatment of Umbilical Hernia. E. Piccoli¹ refers to the frequency of recurrence after operations for umbilical hernia despite the numerous methods employed at present. He thinks this is probably due to the fact that these herniæ are treated in the same manner as other forms with regard to direct union of the muscular layers, while the natural conditions necessary to lasting union are here absent.

¹ Centralbl. f. Chir., January, 1900, No. 2.

The method he employs he believes fully answers all the requirements made upon the treatment of this form of hernia ; of course, the excision of the hernial sac is taken for granted ; a special plastic operation upon the abdominal wall is, however, added to insure in a most simple manner the occlusion of the empty space.

DESCRIPTION OF OPERATION. A median incision is made 10 to 12 cm. long, extending equally far above and below the mouth of the hernial sac, the same deepened to the aponeurosis of the recti ; isolation of the hernial sac, especially in the region of the neck ; reduction of the contents of the sac ; the sac is caught at its base with a small Billroth clamp, and the external portion resected. The partition thus created is closed by continuous sutures of fine silk ; then, by means of the finger, the peritoneal surface is isolated from the anterior abdominal wall, and in the latter, under guidance of the finger, a vertical incision upward and downward, about 3 cm. each, is made with the scissors, so that the generally oval hernial orifice is given an ellipsoidal shape. Thereupon four threads (more than five or less than three will rarely be necessary) are drawn through one of the borders of the opening thus made (generally the left border, because more convenient to the operator) in the following manner :

The stout silk threads are made to pierce the entire thickness of the wall (aponeurosis and muscular layer) 2 to 3 mm. from the border ; they are united by surgical knots, but the ends are not cut for the present. Beginning at the central knot one of the threads, by means of a coarse bent needle, is brought underneath the opposite border and made to pierce the same in its entire thickness about 3 cm. from the free border ; the same procedure is gone through with the second end, then the two threads are drawn rather tight and tied together. This manipulation is repeated with the remaining knots, the further upward and downward we get the nearer the border will be the sutures. (See Fig. 1.)

Finally, the subcutaneous cellular tissue and skin are separately sutured.

The method may be modified ; for instance, if it be impossible to completely isolate the borders of the muscles from the peritoneum, suture of the hernial sac may be omitted and the serous membranes and muscles included in the suture.

The author mentions a case of typical congenital umbilical hernia operated upon by him on August 29, 1899, which made an uninterrupted, complete recovery. The solidity of the umbilical region was entirely reestablished ; an ill-defined fibrous shield could be felt.

This clinical result, he says, is in full accord with the experiments made by him upon large dogs, which show clearly that the scar resulting after his method possesses complete continuity and great power of resistance

(two weeks to four months after operation), as may also be determined by microscopical examination.

Dr. J. A. Blake, in a paper read before the Medical Association of the Greater City of New York, and soon to be published in the *Medical Record*, entitled "The Operative Treatment of Umbilical Hernia in Adults," describes an operation which resembles that of Sapiejko and Piccoli in the lapping of the abdominal wall, but differs in the application of the sutures. The underlapping margin of the rectus is fastened by mattress sutures passed through its edge and the opposite rectus at the proper distance from its margin, while the overlapping rectus is tacked to the anterior sheath of the opposite rectus with interrupted sutures. In all he has operated upon six cases, with very good immediate results, six months being the longest time elapsed since the first operation. He considers that the operation is best adapted to hernia with coexistent diastasis of the recti muscles and loose abdominal walls, but has also employed it with success in other cases where there was considerable tension of the abdominal walls. The operation may also be used in the treatment of enteroptosis with pendulous abdomen.

He states the principal advantages to be: (1) The doubling of the abdominal wall at the hernial site; (2) the breaking of the lines of suture; (3) the broad surfaces for union; (4) the obliteration of the separation of the recti, and (5) the reduction in the size of the abdomen.

Theoretically there are several objections to this method:

1. The increased intra-abdominal pressure due to overlapping would tend to put greater strain upon the wound.

2. The normal action of the recti muscles tends to draw the wound apart.

3. The increased time necessary to perform the somewhat complicated technique of the operation and the extensive dissection of the parts would tend to lessen the chances of securing primary union and increase the already considerable risk of such operations.

Ventral Hernia. The treatment of that variety of ventral hernia following abdominal operations is discussed by Eads, of Chicago.¹ Eads believes that 15 per cent. of all cases upon whom laparotomy has been performed develop ventral hernia within five years after operation, and that the treatment of this form of hernia is one of the greatest importance to physicians and surgeons. During the past two years he has operated upon eight cases of ventral hernia following abdominal section. After reviewing the anatomy of the parts involved Eads states that the great strength of the abdominal parietes is due to the thickness and arrangement of the muscular lamellæ and other aponeurotic expansions.

¹ Annals of Surgery, 1901, vol. xxxiii.

He also points out that the abdominal muscles, either in whole or in part, are helpless and, therefore, useless without their nerve-supply; hence the importance of preserving this nerve-supply in all operations for ventral herniæ. The nerve-supply of the abdominal muscles is derived from the seventh to the twelfth intercostal inclusive, together with ileo-inguinal and ileo-hypogastric. Eads states that the seventh and eighth pursue an oblique direction upward and transversely, supplying the upper third of the abdominal wall; the ninth and tenth passing inward, transversely, to the middle third of the abdomen; the eleventh and twelfth descending obliquely and supplying the lower third. If these nerves be severed the result is a loss of contractile power of the muscle, diminution in blood-supply, with the result that the muscle itself becomes greatly weakened, and a hernia almost inevitably follows. Eads believes that intact, innervated muscular fibres are the only safeguard against hernia. The natural deduction from these facts is the rule to make all abdominal incisions as far as possible parallel or in the direction of the nerves supplying the abdominal muscles. Eads favors a long incision through the skin and superficial fascia, and does not believe it increases the liability of hernia. Its advantages are that it lessens the mortality by providing ample space for the protection of the viscera; it further lessens the shock by diminishing the time of the operation and the duration of the anæsthesia. His rule is "that the incision be long enough to provide every facility for thorough work through the muscular fibres and nerves which have been separated rather than divided."

The intermuscular incision recommended by McBurney for appendicitis, especially chronic or interval cases, is highly commended by Eads. It certainly results in a far smaller number of ventral herniæ than the older incisions. But one case of ventral hernia following this incision in a case of interval operation for appendicitis, with primary union, has come under my observation at the Hospital for Ruptured and Crippled. Wound healing in this case was perfect; yet without any apparent cause a hernia, about the size of an egg, developed about a year after the operation.

When operating upon these cases Eads advises the excision of the redundant and atrophic tissues and bringing into the wound as much muscular fibre as possible. He does not think it is always necessary to enter the peritoneal cavity. In closing the abdominal wound he sutures the peritoneal layer by a continuous suture of fine catgut; then, by means of a curved stout Hagedorn needle and silkworm-gut, the skin, superficial fascia, muscular and fibrous structures, and, lastly, subperitoneal alveolar tissue in the peritoneum near the border of the wound, are sutured in one layer to the corresponding tissues on the opposite side.

This method of suture I believe to be far inferior to closure in separate layers, using an absorbable suture of chromicized kangaroo tendon or chromicized catgut for the buried sutures and silk or silkworm-gut for the skin.

M. M. Johnson, of Hartford,¹ describes an improved technique for the cure of ventral hernia. This method is in brief as follows:

An elliptical incision is made a little within the border of the opening of the abdomen. The skin and superficial fascia, if it can be differentiated, is then dissected back, exposing the sheath of the rectus muscle. On the outer side a smaller dissection is made, an inch or more over the external oblique. The edges of the opening are trimmed and a No. 25 silver-wire suture is inserted at the upper angle of the opening. The suture passes through the peritoneum, rectus muscle, and skin, one inch from the edge; silver-wire sutures are inserted at intervals of one inch through the entire incision. The subcutaneous tissues are then united by a continuous kangaroo tendon suture. The deep sutures are thereupon taken up one by one and the ends of the wire wound around a pencil of ivory on either side and drawn sufficiently tight to relieve the tension on the kangaroo tendon stitches.

This is practically a revival of the old quill method of suture.

Johnson gives a history of two patients operated upon by this method, but they are both too recent to enable one to judge the merits of the operation. Personally, I do not believe it has any great advantage over other methods.

RADICAL CURE OF INGUINAL HERNIA.

Phelps' operation for inguinal hernia has been again strongly advocated by its author.² The main steps of this operation, as described by Dr. Phelps, are as follows: He states that "one of the very serious mistakes made by all operators is ligation of the sac. Frequently—and I have observed it post-mortem—after ligation of the sac retraction of the peritoneum and transversalis fascia takes place, leaving a large surface, varying from three-quarters to two inches in diameter, which is not covered by the fibrous tissue and natural support of the abdominal walls; then, to obviate this accident, I cut off the sac and retract it from the operation precisely as I would from any other abdominal operation, stitching up the peritoneum and transversalis fascia with a continuous suture of silver wire. Over the transversalis fascia and peritoneum a mattress of fine silver wire is placed and the deep layer

¹ Journal American Medical Association, December 22, 1900.

² Medical Record, September 22, 1900.

of muscles stitched over it with a continued suture of silver wire. A small glass drainage-tube is inserted down to the wire mattress for the purpose of drainage. If a large hernial opening is to be stopped and there is very much attenuation of the muscular coats of the abdominal walls a second mattress of wire is placed between the layers of muscles and a superficial layer of muscles, together with the aponeurosis stitched over it. The cord is brought out from the inguinal canal externally and inferior to the internal abdominal ring. A notch made by cutting with the scissors into the aponeurosis of the muscles prevents strangulation and the cord lies directly under the skin in its course to the scrotum."

Although this description is lacking in many important details, from the cuts accompanying this article we find that the aponeurosis of the external oblique is split, as in Bassini's and Halsted's methods, well above the internal ring. Nothing is said as to whether the internal oblique is cut or not, and the illustrations throw no light on the subject. The author states that "since 1892 I have operated upon 216 cases of hernia; 46 were relapsed Bassini's and 51 from other operations, chiefly that of McBurney, and all abdominal wounds I have closed with silver wire fortified after my method, original as far as I know." He states "that the continued suture of fine silver wire will become encysted and remain so during the natural life of the patient." In addition to this a mattress of loops of silver wire is introduced over the transversalis fascia and underneath all of the muscular coats of the abdominal wall. This wire, it is stated, "becomes encysted in the granulating tissue, preventing subsequent stretching. If this wire is sewn into the tissue with continued suture it always becomes encysted and causes no disturbance whatsoever."

"The profession is urged to adopt the operation for hernia in any form and for the purpose of preventing relapse in abdominal operations of any name or nature." He states that the operations upon the relapsed Bassinis are of very great interest to the profession, and goes so far as to "predict that the day is not far distant when Bassini's operation and all others except the one here proposed will be abandoned by every operator."

He adds that this method places the surgeon in the position of being able to "state truthfully to his patient that he can operate and guarantee that there will not be a relapse; the mortality in my series of cases is *nil* and the possibilities of relapse are nothing, and for these reasons, if for no other, the method should commend itself to every operator." He states that the method has been accepted by Prof. Schede, of Bonn, and other distinguished surgeons of Germany.

A method of operation which is set forth thus strongly and which

claims so much invites a critical examination. The value of a new method for the radical cure of hernia is not to be determined by the reputation of its originator as a prophet or by the distinction of the men who "accept it." Its real value can be determined only by a scientific analysis of its results subjected to the test of time. By time we do not mean the number of years since the operation has been performed, but the careful tracing of cases to final results, or for long periods of time.

The paper of Dr. Phelps is strongly defective in this important point, since the after-history of but a single patient is mentioned. It is clear from this that it is impossible to make a fair comparison of the method with Bassini's or any other method except in the single point of mortality, and even here the comparison means little. There should be no mortality in any operation for the radical cure of hernia at the present day under the best aseptic conditions and in uncomplicated cases. While I personally have had two deaths in 840 cases of hernia operations, I had a series of 550 consecutive cases (mostly Bassini) without a single death; one death was from a double pneumonia from ether and the other from a volvulus in a complicated case of large irreducible omental hernia.

At the Johns Hopkins Hospital 470 cases were operated upon, with only one death. At Carle's clinic in Italy 1400 cases were operated upon, with only two deaths.

Since we cannot compare results it remains only to examine the method from an anatomical stand-point. Has it any theoretical ground to warrant the assumption of superiority?

Most surgeons who have had experience with the after-history of wounds of the abdominal wall healing by granulation will decline to accept the statement that "the only way to secure a strong resisting point at this weakened portion of the abdominal walls is by reproducing a large amount of inflammatory material and preventing its stretching by a material that will not absorb and so elastic that it will bend with every motion of the body."

It may be laid down as a general rule that the larger the amount of "inflammatory material" that is thrown out in any abdominal wound the weaker will be the cicatrix after the absorption of that inflammatory material has taken place. The presence of so much silver wire may postpone the date of absorption, but it is hardly likely to render it of permanent value.

The question of suture material for hernia operations is briefly discussed as follows:

"The use of catgut, silkworm-gut, kangaroo tendon, or any other material which will be absorbed defeats the very object at which we

aim. The use of silk is positively contraindicated on account of the danger of infection. Silver wire taken from pure carbolic acid and heated to a red heat by an alcohol lamp before its introduction into the wound furnishes us with a material which is thoroughly sterilized and cannot possibly produce irritation, and all the dangers of infection are avoided." Immediately after this statement we read that infection at the seat of the wire mattress occurred sixteen times in 216 operations, or about 8 per cent. of the cases. This does not include other cases in which late sinuses developed months or years after operation. One such case operated upon by Dr. Phelps I personally observed in which the wound healed primarily, and yet a sinus developed one year after operation and the patient was obliged to go to a hospital and have the wire removed. The disadvantages attending the use of non-absorbable buried sutures in hernia operations have already been so frequently pointed out by Dr. Bull and myself that I will not dwell upon the subject further than to briefly repeat these important points: First, that late sinus formation may and does frequently occur with perfect primary union at time of operation; second, that the usefulness of a buried suture has been fulfilled at the end of three or four weeks, after which time, if non-absorbable, it will cut through and tear the tissues until there is no tension and henceforth remain as a foreign body capable of causing much annoyance and predisposition to relapse by sinus formation; third, that if the "object at which we aim" is the cure of the patient, we can best attain that object by the use of absorbable sutures such as chromicized tendon or catgut, as the series of carefully traced cases of Dr. Bull and myself prove. I have had upward of 200 consecutive patients operated upon, with but a single infection (stitch-hole abscess, not delaying wound healing), and but eight relapses in more than 800 cases of inguinal and femoral hernia.

Since the foregoing was written another paper on the radical cure of hernia has been published by Dr. Phelps.¹ In this paper he states that the transplantation of the cord according to Halsted's method—that is, external to the aponeurosis of the oblique—is the proper method. He further adds that in Bassini's operation "the cord lies underneath the external oblique, and relapses must occur." Against this theoretical assumption, however, he quotes De Garmo's personal experience with 250 Bassini operations. All of these cases were carefully traced, and writing in October, 1897, De Garmo stated that he believed his earlier prediction that permanent cures would be obtained in 90 per cent. of Bassini operations was too low an estimate. Further experience confirmed him in

¹ Annual Address, New York State Medical Society: Medical Record, February 2, 1901.

the belief that 95 per cent. could be cured. My own experience with Bassini's operation fully proves the truth of De Garino's statement. The value of Bassini's operation cannot be judged by the number of relapses that have occurred in the hands of a few surgeons, however distinguished, who have operated on but a comparatively small number of patients. In many of the so-called Bassini operations the ideal operation could not have been performed, as proved by the short cicatrix of the wound. Perfect familiarity with the technique of the operation cannot be acquired by operating a few times. My experience with recurrent hernia at the Hospital for Ruptured and Crippled shows that a large proportion of the patients with relapses from Bassini's operation were operated upon by surgeons whose experience with this operation was comparatively limited. It is an undoubted fact, as our records show, that while operations for the radical cure of hernia have been steadily and rapidly on the increase for the past ten years, the number of patients with a recurrence that present themselves at the hospital for trusses has been just as steadily on the decrease. During the year 1891 sixty-four patients with recurrent hernia applied for treatment at the Hospital for Ruptured and Crippled, while during the past year (1900) but twenty-six applied. This shows more conclusively than anything else the vast improvement in methods and technique over those in vogue a decade ago. That this fact is true is still further confirmed by the paper of Delbet on "The Remote Results of the Radical Cure of Hernia."¹ During the first six months of the year 1900 he states that in the "Service des Bandages" in Paris only seven patients with a recurrent hernia presented themselves. The author concludes that "if the enormous number of operations performed for the radical cure of hernia at the Paris hospitals is taken into consideration, the small number of recurrent herniæ observed in institutions for the supply of trusses is a sure indication that operations for the cure of this affliction are really radical."

The cuts in the more recent paper of Phelps are a decided improvement over those in the earlier paper. They show the point, not brought out in the earlier paper, that both aponeurosis and the internal oblique muscles are cut upward, as in Halsted's operation. In other words, with the single exception of the introduction of the coil (mattress) of silver wire the operation is practically identical with that of Halsted, the only further difference being that a continuous silver-wire suture is substituted for the interrupted silver-wire sutures of Halsted.

We must take issue with the statement of Phelps "that the wire cannot cause suppuration, inasmuch as suppuration is not produced by any

¹ Bulletin et Mémoires de la Société de Chir., 1900, No. 28.

foreign body." This is only partially true. It makes little difference to the patient whether the silver wire itself produces suppuration, with a consequently slowly healing sinus, or whether the irritation of the silver wire or foreign body causes a localization of the bacteria which in some unknown way effect an entrance to the region of the wire; the result is the same, and slowly healing, troublesome sinuses do develop in a considerable number of cases in which the original buried suture was absolutely sterile and the wound healed by perfect primary union. As previously stated, this condition actually did occur, and a year later the patient had to seek relief in a second operation for removal of the wire.

I have recently observed a patient, aged fifty-one years, who was operated upon at the city hospital by Dr. Phelps' method, in January, 1900, for a small reducible inguinal hernia. The patient states that a sinus followed the operation, and that this sinus failed to heal, though he was kept in the hospital from January until May. In April the sinus was curetted by one of the other attending surgeons and some wire was removed. He left the hospital in May with the sinus still open; was treated in the out-patient department of the Hudson Street Hospital until December, when the remainder of the wire was removed. Not until then did the sinus heal. When I examined him, February 21, 1901, there was a relapse (scrotal) the size of two fists, and the cicatrix, six inches long by one-half in width, was so thin and tender that the rupture could not possibly be controlled by a truss. A second operation in the presence of so much cicatricial tissue offers little hope of relief, and the patient otherwise in good health has not only been incapacitated for work for more than a year but seems destined to be an invalid the rest of his life.

How many other cases resulted in a similar manner it is impossible to state, as this paper, like all of the preceding papers by Dr. Phelps, gives practically no final results. The only data given in lieu of the carefully traced after-histories of patients reported by Bassini, Halsted, Bull, De Garmo, and myself are found in the general statement that "many of my cases I have followed—just what number I do not know; there were thirty cases from 1892 to 1896 that I have seen personally without relapse." The important point as to the interval between operation and observation is not mentioned.

RESULTS OF OPERATION FOR HERNIA BY BASSINI'S METHOD. In a recent communication from Dr. W. B. De Garmo, dated February 27, 1901, he states that of 739 operations for hernia 611 have been for inguinal hernia by Bassini's method. These cases, with exception of those operated upon during the last year and a half, have been most carefully traced, and but eight recurrences have been observed. The

causes of these recurrences, De Garmo states, have been threefold: One was due to an incomplete operation. In three recurrence followed operation for sigmoid or cæcal hernia—the varieties of hernia in which radical cure is acknowledged to be most difficult. Fatty degeneration of the muscular wall of the abdomen occurring in heavy beer-drinkers he believes to have been the cause of recurrence in the remaining four. He states that not a single recurrence has been observed in a patient with good muscular structure except in sigmoid or cæcal hernia, and no occurrence was noticed in a patient under the age of forty years.

These are certainly brilliant results and furnish additional proof—if further proof were needed—that in Bassini's method we have at last found an ideal operation for the radical cure of hernia.

As further and most convincing proof of the superiority of Bassini's method may be cited the results obtained at the clinic of Prof. Carle.¹

During the last decade, from January, 1889, to June, 1899, 1400 operations were performed upon 1285 patients for the radical cure of hernia at this clinic, with but two deaths, one of which was from pneumonia on the seventh day after operation. Of these 1400 operations 1120 were done according to Bassini's method and 280 by Kocher's method. Recognizing that the value of any method of radical cure can be determined only by tracing the after-history of the patients, Galeazzi was able to ascertain the condition of 840 cases in which a period of two years or more had elapsed between the date of operation and the date of examination; of these 840 cases 525 were examined by himself and the remainder by the house physician; 792, or 94.29 per cent., remained perfectly cured, and 48, or 5.71 per cent., showed a recurrence.

Galeazzi has further collected 1334 cases of hernia operated upon by Bassini's method by surgeons outside of Italy, with only 2.16 per cent. relapses.

The cases at Carle's clinic furnish additional proof of the importance of primary wound healing in effecting a permanent cure. Of 128 cases of secondary wound healing 10, or 7.9 per cent., relapsed.

That relapse is far more frequent during the first year after operation is confirmed by Carle's cases. Of the 10 referred to 7 occurred, the first year and 2 the second, and but 1 after two years. Galeazzi states that in 84 cases the hernia was voluminous, and of these cases but 2 relapsed. He calls attention to the danger attending operation in a large, irreducible hernia, and refers to the statistics of Kramer² showing

¹ "Risultati definitive nella cura operativa dell'ernia inguinale," by Galeazzi. Estratto della clin. chir., 1899, No. 6.

² Arch. f. klin. Chir., Bd. 1., Heft 1.

that of 172 operations for very large hernia 21, or 12.20 per cent., died as a result of the operation and 57.56 per cent. suppurated. Galeazzi considers Bassini's method more logical, more surgical, and more secure than Kocher's. He believes the superiority of Bassini's method is especially shown in cases in which the canal is not straight, as the obliquity of the channel favors its closure at the moment when the intra-abdominal pressure is exerted or increased, and to this fact he attributes the splendid results that have been obtained by Bassini's method.

The results at Carle's clinic go far to justify Galeazzi in his conclusions.

TREATMENT OF ECTOPIC TESTICLE ASSOCIATED WITH HERNIA. Championnière's experience in the treatment of ectopic testicle associated with hernia has been very large. During the past twelve years he has operated upon 44 cases. The method employed was: Fixation of the testicle in 19; extirpation in 15; the testis was preserved, but not anchored, in the remainder.

He regards operation as difficult and delicate in young subjects; in the very young he strongly advises against operation. He has only operated upon three young patients, aged eight, ten, and eleven years, although he states he would certainly have had occasion to operate on more of the younger cases had he had charge of a regular children's ward. Seventeen patients were more than twenty years of age; the remainder between fifteen and twenty years. There has been no return of the hernia in any of the cases whether castration was employed or not, and he strongly advises preservation of the testicle when possible.

The latest statistics of Championnière are to be found in a monograph entitled *Cure Radicale de la Hernie Inguinale*, recently sent me by the author. He has operated upon 759 inguinal herniæ, 74 crural, 31 umbilical, 15 epigastric, and 22 eventrations. Of the inguinal herniæ 687 were in the male and 72 in the female. Most of the cases of inguinal hernia were operated upon by the method originated by Championnière many years ago, and published in his well-known work on *Hernia*. He states that the mortality was less than 1 per cent., there having been but 6 deaths in the total number. He had one series of 265 consecutive cases without a single death.

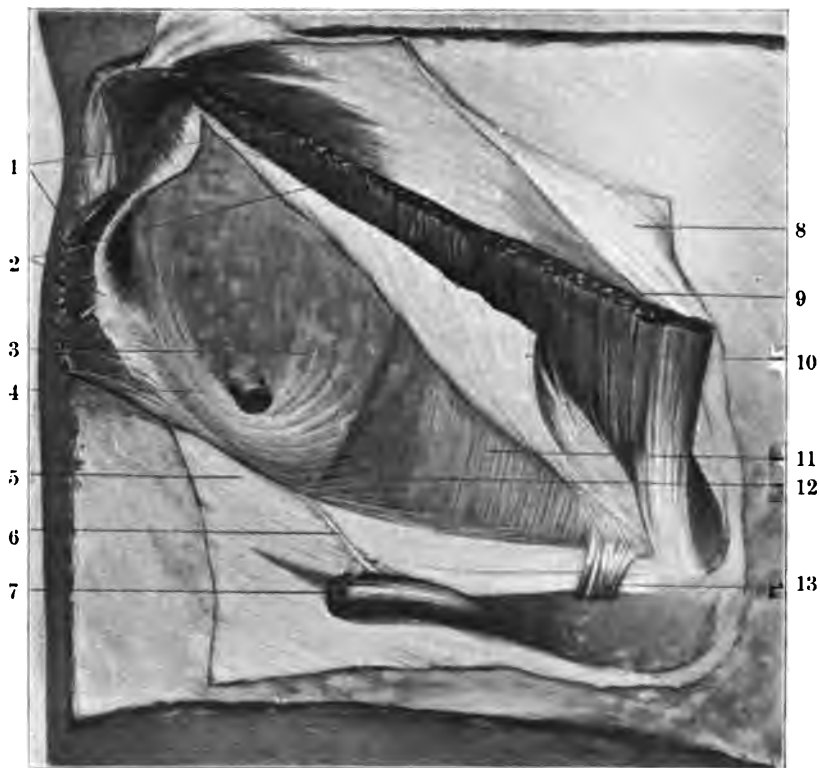
As to final results, of 655 inguinal herniæ in the male, recurrence was observed in 30, or 5 per cent.

In the 72 cases of inguinal herniæ in the female he employed the method which he has long advocated—the excision of the round ligament as high as the internal ring, with closure of the canal according to his method in the male. He has observed 3 cases of recurrence.

This method, as I have already pointed out a year ago, I believe to be much inferior to that of splitting up the external aponeurosis, dis-

secting the sac free from the round ligament, permitting the round ligament to drop back into the lower angle of the wound, and closing the canal precisely as in Bassini's method in the male. This method I have employed without exception in 154 cases within the last ten years, without a single relapse.

FIG. 2.



1. Internal oblique (reflected). 2. Transversalis reflected). 3. Transversalis fascia (lig. inguinalis mediale). 4. Transversalis fascia (lig. inguinalis laterale). 5. Poupart's ligament. 6. Genito-crural nerve. 7. Spermatic cord (cut and reflected). 8. External oblique (reflected). 9. Internal oblique (reflected). 10. Transversalis (reflected). 11. Transversalis fascia (inner vertical fibres). 12. Transversalis fascia (thinner portion). 13. Conjoined tendon.

In my last article¹ I referred at some length to the paper of Dr. Blake² on the "Relative Bearing of the Conjoined Tendon and the Internal Oblique Muscle on the Radical Cure of Inguinal Hernia." By the courtesy of the author I was able to give a résumé of the paper before its publication. The subject is one of so much importance, from both an anatomical and surgical stand-point, and the illustrations so good,

¹ PROGRESSIVE MEDICINE, June, 1900.

² Medical Record, September 1, 1900.

that I consider it worthy of further mention. Fig. 2, taken from the original dissections of the author, is exceedingly valuable. Blake has made careful dissections of the inguinal region on both sides in twenty-five selected muscular subjects in whom the parts were normal. He found that in no case did the conjoined tendon extend more than five-eighths of an inch laterally from the insertion of the rectus. In the majority the extent was less than one-half an inch and in some subjects it was unappreciable. In all cases it consisted only of scattered muscular or tendinous fibres. There was uniformly, however, a distinct dorsal wall to the inguinal canal formed by the thickened transversalis fascia. He states that it had not occurred to him at first that the Baltimore surgeon referred to this fascia of the conjoined tendon, but on reading Quain's description and Halsted's discussion of Twik's paper on "The Surgical Anatomy of Hernia" he found this to be the case. He further states that unless we call this fascia "conjoined tendon" we cannot accept Bloodgood's term "obliteration of the conjoined tendon." It is entirely distinct from the historic conjoined tendon, being separated from it by the main aponeurosis of the transversalis. "Although forming the main support of this region it has nothing to do with the operation for radical cure, inasmuch as only structures that lie in front of it are sutured. The true conjoined tendon is ordinarily such a weak affair that it may be completely ignored in operative procedures."

PERSONAL RESULTS. My own results will soon be published in full in a paper to be read before the American Surgical Association. I have operated upon 855 cases between the years 1891 and 1901; of these 781 operations were for inguinal hernia and 766 according to Bassini's method, with the substitution of chromicized kangaroo tendon for silk for the buried sutures. Fifty-four operations were for femoral and 20 for umbilical and ventral hernia.

While I have not yet completed my work in tracing the patients, the results thus far noted are in brief as follows: Of 54 cases of femoral hernia but 1 relapse has been observed; 21 patients were well two to nine years and 11 from one to two years, making 32 well from one to nine years after operation. About two-thirds of the patients were operated upon by the method of purse-string suture of the femoral canal with chromicized kangaroo tendon, and in the remainder Bassini's method was employed.

The single relapse that was noted occurred in a patient operated upon by Bassini's method, yet as this was the only one in which there was suppuration the method cannot be held responsible for the result. The relapse is so slight that it can with difficulty be detected, and though the patient has worn no truss it has not increased in three years.

In 16 cases in which the canal was sutured without transplanting the cord, 4 neoplasms occurred.

Results of Bassini's Method for Inguinal Hernia. Of 766 cases 500 have been traced from one to nine and a half years, with 7 relapses, or less than 1 per cent.

I have operated upon 154 cases of inguinal hernia in the female, closing the canal after the manner of Bassini, preserving the round ligament, but not transplanting it, and allowing it to drop down into the lower angle of the deep layer of sutures. Not a single relapse has thus far been observed, and 57 cases have been traced from two to eight years.

Operation upon a Very Large Hernia. Keen¹ reports a large scrotal hernia operated upon for radical cure, under spinal anæsthesia with eucaïne, with "operative recovery, death from exhaustion, and urinary sepsis." This case is interesting, as it brings up the question of the propriety of performing operation for radical cure in the class of cases of which this is a type, viz.: "the patient is a man, aged fifty-one years, with a large, left-sided scrotal hernia extending nearly to the knees. The ring is so large that four fingers can be inserted without trouble. The hernia can be reduced with moderate ease, but the abdomen, which prior to the return of the hernia was scaphoid, then becomes arched and very tense, causing a great deal of discomfort, especially in breathing." The specific gravity of the urine was 1012, with a small amount of albumin, but no casts. Operation was performed on October 13, 1900, Bassini's method being employed under spinal anæsthesia with eucaïne. The time consumed by the operation was forty-five minutes. The scrotum contained not only a portion of the small intestine but half of the colon, including the caput coli and appendix. This is interesting, inasmuch as the hernia was left inguinal. There was some nausea and vomiting about the middle of the operation. The wound was closed with interrupted sutures of aluminium bronzed wire for the muscular layers, continuous silk for the external oblique, and interrupted silkworm-gut for the skin. Temperature rose to 101° F. on the following day. At the end of the week the wound was well and the stitches were removed. Two days after the operation it was necessary to catheterize the patient, whereupon a tight stricture was discovered. The same was dilated up to No. 19. "The urine became increasingly turbid, the patient grew rapidly weaker and weaker, and died of exhaustion eighteen days after the operation."

While this cannot strictly be called an operative death we must, I think, regard it as a result of the operation, and this case strengthens

¹ Philadelphia Medical Journal, November 3, 1900.

the opinion long held by Dr. Bull and myself that cases of this type should seldom be subjected to radical cure. The objections to operation have been chiefly urged against large, irreducible herniæ; but even when reducible, if the rupture attains sufficient size to markedly change the contour of the abdomen when reduced and to cause great discomfort in breathing, the wisdom of operative interference is certainly questionable.

Keen's reason for using spinal anæsthesia in this particular case was that the kidneys were not sound.

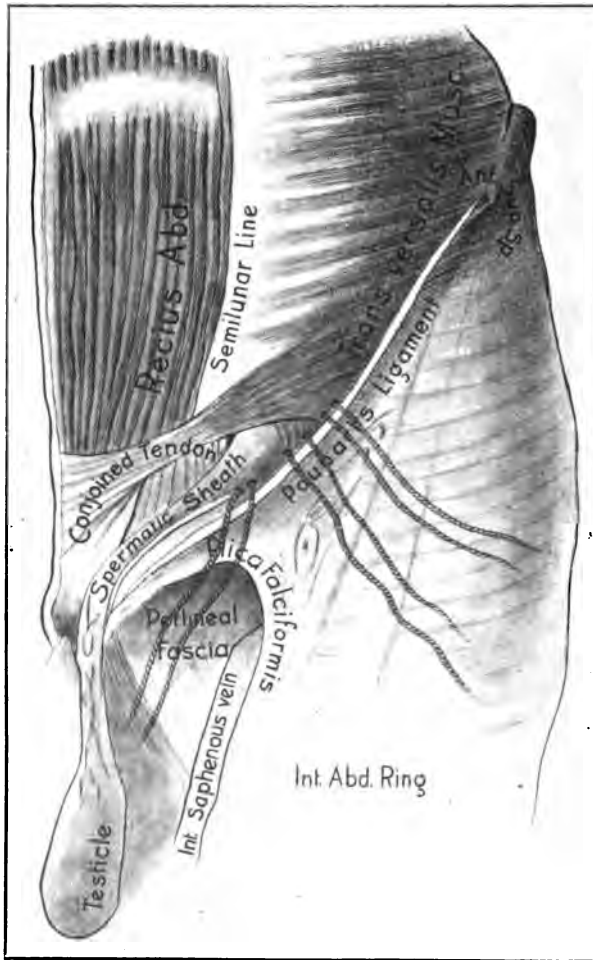
As regards the general use of spinal anæsthesia, Keen believes that the chief danger of the method lies in the direction of imperfect asepsis, and that it should be used only by competent, skilled, and careful surgeons. He does not believe it will ever replace chloroform or ether as a routine anæsthetic. This position we believe to be the correct one. Certainly no fair comparison between spinal anæsthesia and ether or chloroform is possible at the present moment, nor can it be possible until a far larger number of cases of spinal anæsthesia are at hand. Personally I do not think we are at present sufficiently sure of its comparative safety to justify us in employing it except under conditions which strongly contraindicate the use of a general anæsthetic.

Radical Cure of Femoral Hernia. During the past year another new method of operating for the radical cure of femoral hernia has been brought out which seems worthy of mention. It is known as Gordon's operation. The operation was described by its author in the *London Lancet*, October, 1900. Dr. Leonard Woolsey Bacon, Jr.,¹ of New Haven, has made a very careful anatomical study of the operation and believes it to be the best method yet devised for effecting a cure of femoral hernia. Bacon believes that in most or practically all operations for femoral hernia, no matter how firmly the crural end of the canal has been closed, its abdominal end is not satisfactorily obliterated. Thus there always remains a chance for a knuckle of gut or omentum to work its way along the track of the old hernia, thereby tending to a recurrence. The chief point in satisfactorily closing the crural orifice of the femoral canal, Bacon states, is the difficulty in making the already tense cord of the arc—that is, Poupart's ligament—come into apposition with the arc itself, namely, with the surface of the innominate bone. Bacon discusses at some length the method of purse-string suture, with high ligation of the sac as well as Bassini's operation for femoral hernia. He believes there are two weak points in Bassini's method: First, that the abdominal orifice of the femoral canal is not closed; second, that the method is mechanically defective in that the

¹ *Yale Medical Journal*, January, 1901.

inelastic Poupart's ligament has a constant tendency to pull away from the artificial approximation to the tissues below. Bacon states that he has operated five times for the radical cure of femoral hernia. The first operation was done for a strangulated enterocele of large size, in a German woman, upward of forty-five years of age. He employed

FIG. 3.

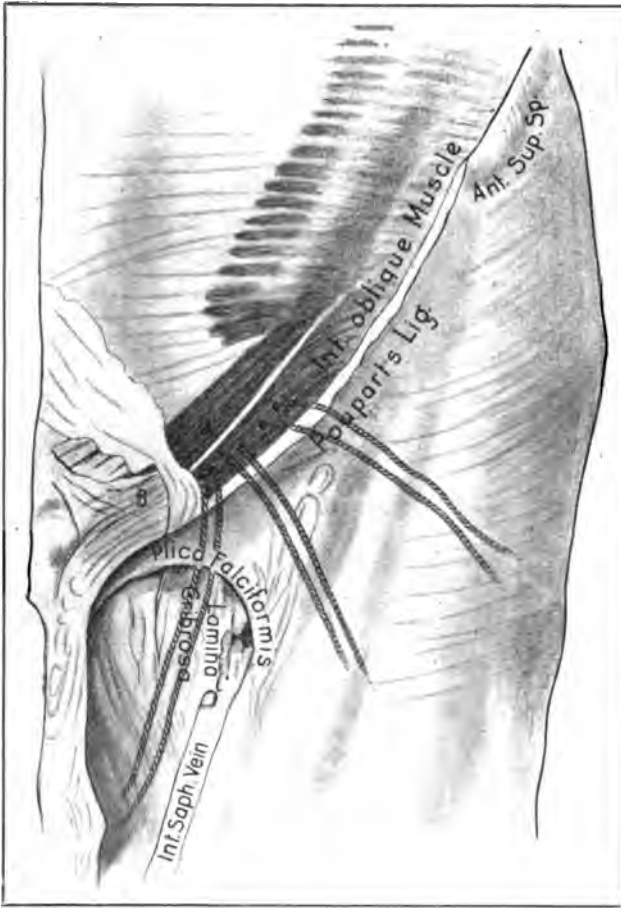


Gordon's operation for femoral hernia; showing transversalis muscle and conjoined tendon. (BACON.)

Bassini's method and there was no relapse at the end of five years. This certainly seems a very good test of the method. In a second case he also employed Bassini's operation, the patient being a young woman, aged twenty-eight years, with a small, reducible hernia. He states that

the hernia recurred at the end of six weeks. Whether or not suppuration occurred is not mentioned. His three other cases were all operated upon during the year 1900, and in these the Gordon method was employed. Bacon has studied the anatomy of the femoral region very carefully, and Figs. 3, 4, and 5 are of great service in enabling one to

FIG. 4.



Gordon's operation for femoral hernia; showing internal oblique muscle, and both divisions of the conjoined tendon, A and B. (BACON.)

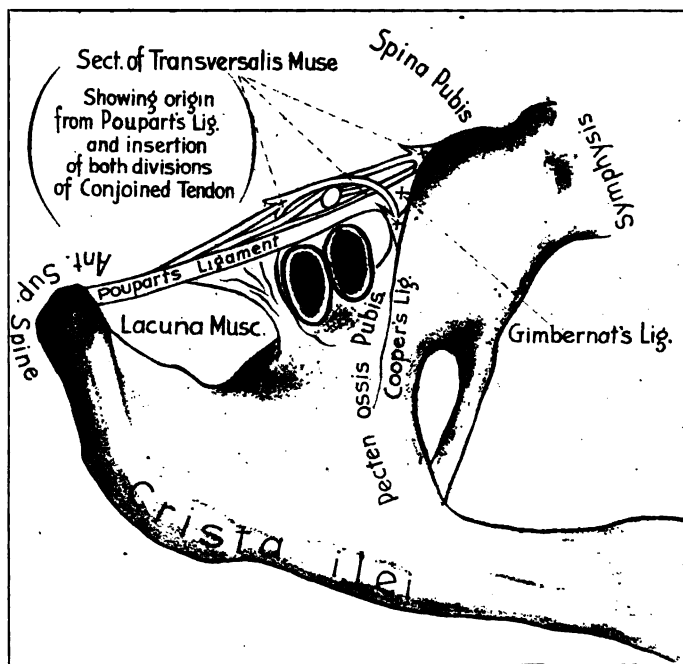
understand the principal steps of the Gordon operation. The method, however, is complicated, and even with the help of the cuts it is not easy to describe it. The primary incision begins at a point two inches from the pubic spine and three-quarters of an inch above Poupart's ligament, passing first inward, parallel to Poupart's ligament, as far as the hernia or as far as the situation of the femoral canal, thence turning

downward, in line with the axis of the leg, over the hernial sac to its lower border. This constitutes the first step in the operation.

The second step consists in carefully preparing the anterior surface of the aponeurosis of the external oblique muscle in the upper part of the incision for a full inch from its reflected border.

The third step consists in the isolation of the hernial sac and return of its contents into the abdominal cavity. The hernial sac is then drawn down and freed from the subperitoneal fat. It may be necessary to open the sac before reducing its contents.

FIG. 5.



Gordon's operation for femoral hernia. (BACON.)

The fourth step, which consumes most time, consists in thoroughly cleaning out the pectineal fascia in the upper part of the fossa ovales and removing all the fat and connective tissue from the femoral canal. The crural vein should be positively identified. Care should be taken not to injure the saphenous vein, and the falciform process of the fascia lata should not be interfered with.

The fifth step consists in the treatment of the sac. Bacon states that resection with suture of the peritoneum is the most workman-like way, although if haste is necessary it may be transfixed and ligated as high up as possible.

The sixth step consists in an independent incision in the aponeurosis of the external oblique muscle in the direction of its fibres about three-quarters of an inch above Poupart's ligament, extending from a point well above the femoral vessels at a point internal to the free edge of Gimbernat's ligament. The incision having been made in the aponeurosis the underlying external oblique and transversalis fascia should be gently separated from Poupart's ligament with the handle of the scalpel and the trough, "and this structure emptied, as it were, of its muscular contents as far as the incision in the aponeurosis extends." When this step has been properly carried out Poupart's ligament lies stretched in its normal position, the cord of the arc running from the anterior superior spine of the ilium direct to the pubic spine, and the external oblique and transversalis muscle, now no longer supported by Poupart's ligament, sag of their own weight and lie against the horizontal ramus of the pubic spine.

The seventh step is that of fastening these muscles in their new position with appropriate sutures. For this purpose Bacon advocates plain catgut of medium size, although he says chromicized catgut and other material may be used if desired. The sutures are placed with a small, full-curved stout needle.

The eighth step consists in suturing with fine catgut the incision in the aponeurosis.

The ninth and final step consists in closing the cutaneous incision with fine silkworm-gut.

This operation is too recent to permit of criticism as to its permanent results. The theoretical objections to it are that it is far more complicated than the operations of Bassini and the purse-string method, and that if suppuration should occur there would be serious risk not only of a recurrence of the femoral but of the development of an inguinal hernia. The results of these two methods (Bassini's and the purse-string) have so far been so nearly ideal that I do not believe they should give place to such a complicated method as Gordon's unless it be in exceptional cases.

While appreciating the excellent statistics of Bassini's method of operation for femoral hernia in his own hands, Bacon is inclined to regard the successes due more to the peculiar skill of the individual operator than to the method itself, which he considers mechanically defective. If Bassini were the only surgeon able to obtain good results from this method the criticism would certainly be valid. This, however, I do not believe to be the fact. I personally have operated upon fifty-four cases of femoral hernia during the past ten years, above one-third of which were operated upon by Bassini's method, and the remainder by purse-string suture of the crural canal. These cases have

not been selected, and in no case has the operation been refused because of the size of the hernia. I have been able to trace the after-history of some of these cases, and thus far but a single case has relapsed. In this case Bassini's method was employed and suppuration followed, which was undoubtedly responsible for the failure.

These results, combined with Bassini's own statistics, are sufficient, I think, to prove that the great majority of cases of femoral hernia may be radically cured by far simpler methods than the Gordon operation.

Hernia of the Cæcum and Sigmoid Flexure. Weir, of New York, in the *Medical Record*, February 24, 1900; discusses the treatment of sliding hernia of the cæcum and sigmoid flexure. These slipped "herniæ," or "hernies par glissement," as described by French authors, differ very distinctly from ordinary inguinal herniæ. The usual peritoneal sac is imperfect and generally lacking in its posterolateral aspect, or, as Dr. Weir puts it, "the protruded bowel is still outside the peritoneum. The bowel has been forced down and carries with it a fold of loosened peritoneum into the scrotum, precisely as happens in the descent of the testicle." This condition, while much more common in the cæcum, is occasionally observed in the sigmoid flexure; the great majority of sigmoid herniæ have complete sacs. From the investigations of Treves, Scarpa, and Bardeleben it has been found that the complete peritoneal covering of the cæcum is lacking only in about 18 per cent. of the cases. Merigot Treigney¹ collected 50 cases of hernia of the large intestine. Of these 13 contained the cæcum and appendix, 11 the cæcum and portion of the ileum, 22 the appendix alone, and 4 the transverse colon. The difficulty of operating upon the class of slipped or sliding hernia of the cæcum and sigmoid are pointed out by Weir. Of 20 cases collected by Treigney in which the ascending or descending colon alone or accompanied by the cæcum or sigmoid flexure was involved, a whole sac was found only in seven cases; in 8 the hernia was par glissement. Clinically this condition can be frequently diagnosticated by the fact that attempts to replace the protruding bowel into the abdominal cavity accomplish little; while a certain portion may be reduced, a considerable portion is always left behind and usually can be differentiated from adherent omentum.

In a number of these cases which I have observed at the Hospital for Ruptured and Crippled the diagnosis has been made in this manner. According to Dr. Weir, they are more frequent in the left side of males in middle or advanced life. He states that it is difficult to determine their nature before surgical intervention. Their usual pre-operative history is that of an early, reducible hernia, not always amenable to a

¹ Thèse de Paris, 1887, i.

truss or taxis. This soon passes into a permanent, irreducible condition. Sometimes one can, in a left-sided hernia, suspect its being a sigmoid hernia or descending colon from the fact that only a small quantity of fluid can be injected into the rectum. So great are the difficulties of diagnosis, however, that Weir thinks that time is only misspent endeavoring to solve the problem except with the scalpel.

My own experience does not support the opinion of Weir that the slipped herniæ are more common on the left than on the right side, nor do I believe that they are more common in males in middle or advanced life. The opinion of Weir is largely based upon statistics of Treigney, and these statistics are derived chiefly from operations upon hernia in adult life. In fact, very few statistics of operations upon hernia in children, with sufficiently full details for comparison, are available. An analysis of the 775 cases of hernia in children operated upon at the Hospital for Ruptured and Crippled shows a comparatively large number of cæcal hernia (upwards of thirty), a considerable proportion of which are of the variety described by Weir. My personal statistics show a greater number of sliding hernia in children than in adults, and I believe that when statistics are sufficiently complete to make a fair comparison possible we shall find this to be true in general.

In regard to treatment Weir states that Droiite, in 1882, finding a slipped sigmoid hernia in a cadaver, stated that he could reduce it only by completely separating the bowel along its mesenteric attachment up to the external ring. Weir states that in his earlier cases he attempted to push up the bowel toward the external ring and to hold it there by sutures carried from below the intestines to the sides of the ring or through the abdominal wall. This operation resulted in no benefit. Later he employed the separation of the bowel from the subperitoneal bed. This, while generally easy, occasionally offers difficulties from the denseness of the tissues, and injury to the nutrient vessels of the intestine may result in gangrene. In two cases Guillard, of Geneva, who was unable to reduce the bowel, resected it and joined the divided ends with the Murphy button, with success. In addition he removed the testis and spermatic cord. Weir states that Heydenreich operated upon two cases with a cæcal fistula, resulting in death. Reverdin, Berger, Terrier, and Fröhlich all failed to cure the hernia. Weir has operated upon six cases of sigmoid hernia and four of cæcal. In two of the sigmoid hernia he separated the bowel by dissection carried on mainly by the finger. After freeing it he pushed it into the abdominal cavity and sutured the ring and canal. In three others he pushed the bowel back with some difficulty and sutured the internal ring, but in a few months recurrence followed. Of the four cæcal herniæ two were the cæcum proper, and reducible, having a complete sac; one was in the

femoral sac; another a left inguinal rupture; the remaining, cæcal and sigmoid one each, were operated upon in the following manner: In order to cover the raw surfaces of the bowel left after separating it from its bed Weir made a flap of the peritoneal portion of the sac; this was turned backward and sutured behind the gut as far as practicable. The ring was then sewed together after the newly covered bowel was reduced. Weir believes that if the patient is willing to sacrifice the testicle on this side a radical cure can be reasonably looked for. In two of the cases operated upon by this method by Weir eight months had elapsed without relapse.

The objection to the use of this rather extensive transplantation of the sac is the liability to slough. I do not believe it necessary to remove the testis in these cases. I have operated upon twenty-nine patients with cæcal and sigmoid hernia and thus far there have been only two relapses.

The Treatment of Hernia by Injection Methods. I have frequently pointed out that such methods are both unsatisfactory and unscientific, and that they are attended with serious risk is proved by the history of the following case, for which I am greatly indebted to Dr. Henry C. Coe. On February 28, 1901, Dr. Coe operated upon a man, aged seventy-one years, for acute intestinal obstruction. The patient stated that he had had a hernia (scrotal) of several years' duration, and that in October, 1900, an attempt had been made to cure it by the injection of an irritating fluid of unknown composition. The hernia was reduced, and after repeated injections, always very painful, it had not come down. From the time the treatment was discontinued until the attack of obstruction he had had frequent attacks of severe colicky pain in the iliac region.

On opening the abdomen Dr. Coe found about one foot of small intestine bound together with old adhesions. In addition there were numerous patches of partial necrosis of the serous portion of the bowel, and in one place this included practically all of the coats, necessitating partial resection. These necrosed areas were of dark color, due apparently to the injected fluid.

The patient died on the second day after operation.

"The Association of Inguinal Hernia with the Descent of the Testes." This is the subject of the Bradshaw lecture of 1900 by John Langdon. Langdon states that the descent of the testes is a developmental process which exerts a dominant influence as a cause of hernia in infants, but an influence which becomes less and less powerful as age advances. He states that the descent of the testes is accomplished in part by the greater development of the upper part of the body, in part by a vital process, but chiefly by the action of the gubernaculum testis.

The gubernaculum is situated between the peritoneum and psoas muscle. "It is attached by its upper end or apex to the testes, while its lower end frays out like a goose's foot. One of these lower processes is attached to the pubic crest; another, and by far the largest and strongest, passes into the scrotum; while a third is attached to Poupart's ligament close to the inguinal canal."

The explanation of the various malpositions of the testis Langdon believes to be found in the accessory prolongations of the gubernaculum, which sometimes pass to the saphenous fascia over Scarpa's triangle, more rarely into the perineum. Langdon brings out a point not generally known and but seldom mentioned, that the vaginal process or serous prolongation of the peritoneum does not appear to be dependent on the descent of the testis, inasmuch as instances are not rare in which the testis is completely retained, and yet there is a vaginal process lying complete in the scrotum and entirely shut off from the general abdomino-peritoneal cavity. Langdon states that he has himself on many occasions seen instances of a long vaginal process, containing more or less hydrocele fluid, far in advance of a partially descended testis. I have myself observed this condition on several occasions. Langdon calls attention to the great preponderance of hernia in male infants over that in females, inguinal hernia occurring eleven times more frequently in boys than in girls under the age of twelve months, the exact figures being 3215 infant boys to 298 infant girls. Inguinal hernia in infant boys is three times more frequent on the right side than on the left, whereas in infant girls the two sides are nearly equal. In the first year of life hernia in boys reaches the high percentage of 15.22 of the total number, whereas in girls it is only 8.55. Of 27,318 herniæ in males of all ages Langdon found 15,312 right, 9105 left, and 2901 double. Langdon believes that herniæ are largely associated with testes which fail to descend to their normal position in the scrotum; that this is true whether they be completely retained in the abdomen or arrested in their descent or misplaced in regions outside the normal course, for example, the thigh, perineum, or pubic regions. The statement that retained testes are liable to become the seat of malignant disease has been frequently mentioned by high authorities as a reason for the removal of the testes in operations for the cure of an accompanying hernia. Langdon very strongly questions the accuracy of this view. He says that from his own experience, both in public practice and in private, he believes it to be devoid of any foundation in fact. He further adds that reference to the Registrar-General's reports fully corroborates his own experience. Personally I believe that Langdon's opinion is correct, as in eleven years at the Hospital for Ruptured and Crippled I have never seen a case of malignant disease

occurring in an undescended testis. Furthermore, during a considerable experience with malignant disease of the testis—having observed sixteen cases—the disease in every instance occurred in a fully descended testis. Langdon has made a very careful examination of the histories of 7661 males who were the subjects of hernia with especial reference to the condition of the testis. In 174 of these cases the testes were misplaced in the following positions: (1) Completely retained in the abdomen, 16; (2) in the inguinal canal, 52; (3) at the mouth of the external abdominal ring, 73; (4) ectopic testis, 2; (5) cruroscrotal, 3; (6) smaller testis placed normally in the scrotum, 16; (7) malposed testis without hernia, 10. The importance of misplaced or undescended testis as a causal factor in the production of interstitial or preperitoneal herniæ is well brought out by the statistics of Langdon.

Interstitial hernia is primarily situated within the abdominal muscular walls, usually in the patent vaginal process, within which is found a fully developed testis. In forty-two cases of interstitial hernia in males there were only two instances in which the testes were normally developed in the scrotum. The position of the testis varied within large limits. In twenty-six cases it was situated in the inguinal canal. In four cases it was outside the external abdominal ring; in two cases high up in the scrotum. The frequency with which interstitial hernia is observed is estimated by Langdon as 1 in 1100 cases. This estimate is based upon a study of 50,000 cases. Langdon says very little about the testis misplaced in the perineum. These cases are probably included in the ten cases of malplaced testis without hernia. At the Hospital for Ruptured and Crippled I have personally observed six cases of testis in the perineum, and in four of these cases there was an accompanying well-developed hernia, the latter, following the course of the testis, appearing in the perineum rather than the scrotum. In one of these cases in which the hernia was the size of a cocoanut and the testis very small and ill developed the testis and entire pouch were removed and the canal closed in three layers. In the other three cases the testis was well developed, and I was able to preserve a sufficient amount of peritoneum to make a perfect tunica vaginalis and succeeded in transplanting the testis into a new pouch formed with the finger in the hitherto empty scrotum. The patients recovered and the hernia remained perfectly cured.

In addition to these six cases I have operated upon thirty cases of undescended or partially descended testis associated with hernia. Fourteen of these cases were between the ages of ten to fourteen years; one case was twenty-one years old. The testis was not removed in a single case, and I believe that in practically all cases of undescended testis associated with hernia in which operation is indicated it will be

found possible to bring the testicle down outside of the external ring. The canal can then be closed either by Bassini's method or by allowing the cord to come out at the lower angle of the wound without transplantation. This latter method permits the testis to be brought down from one-half to three-quarters of an inch lower than when the cord is transplanted. In most of these cases the testis was found to be smaller in size than its mate, and in my earlier cases, operated upon between 1893 and 1895, an attempt was made to anchor the testis in the scrotum. In most of these the testis retracted to a position just outside of the external ring. There seems to be no great advantage in the various methods of anchoring the testis to the scrotum or to wire frames outside of the scrotum. In my own cases I have adopted Bassini's method, with but one exception. The result, as far as a cure of the hernia is concerned, has been perfect in every instance. I do not believe that the operation should be performed as a routine measure much before the age of ten to twelve years, for the reason that in many of these cases the testis descends into the scrotum or below the external ring at about the age of puberty. The accompanying rupture is usually small, has little tendency to become strangulated, and can be easily retained by a light spring truss, the pad resting above the testis.

Powers,¹ in an article entitled "The Management of Abdominal Testicula Ectopia Associated with Inguinal Hernia," states that Finotti believes that "the inguinal retention of a testis is due to congenital developmental disturbances, and that such a testis is therefore peculiarly subject to malignant change, especially sarcoma." As I have already stated, neither Finotti nor anyone else, as far as I have been able to learn from a rather careful study of the literature, has offered any facts to support the opinion that the undescended testis has a greater liability to malignant disease.

Carle² mentions two cases of ectopic testis showing a condition similar to that described by Langdon, in which the hernia descended into the scrotum, while the testes and cord remained attached to the posterior wall of the inguinal canal. In both cases the testis was freed and brought down and the canal closed by Bassini's method, resulting in a radical cure.

Carle has operated upon fifteen cases of undescended testis ectopia cruro-scrotalis (two bilateral). In two of these cases he observed the disposition described by Cloquet, in which the vas deferens and epididymis were in the bottom of the scrotum, while the testis itself was at the external ring. The result of Carle's operation in these cases of

¹ Boston Medical and Surgical Journal, November 8, 1900, p. 475.

² Loc. cit.

ectopic testes with hernia is stated in but four cases, in which cases it was satisfactory.

As to the treatment of hernia associated with undescended testes there is no procedure that is as yet recognized as ideal. In the case reported by Powers the testis was removed for the reason stated, that the testes "could only be made to lie just above the external ring, and even then there was some tension on it." The weight of opinion at present I believe favors the opinion that the testis, though atrophied and possibly without functional power, nevertheless plays an important rôle in the development of the man and should not be sacrificed without strong reasons. Championnière has operated on thirty-seven cases of undescended testis, and his rule is to preserve the testes in all possible cases.

Gangrenous Herniæ. Hofmeister,¹ in an article on the "Treatment of Gangrenous Herniæ with Primary Resection of the Intestine," refers to the prediction of Kocher, some twenty years ago, "that it should be our rule in cases of gangrenous intestine in incarcerated hernia to practice excision and suture of the intestine, instead of establishing an artificial anus." Ten years later Mikulicz came forward and strongly advocated this method, and yet as late as 1898 v. Bramann, at the Surgical Congress, again defended the establishment of an artificial anus as the method of choice. Thus the question as to the normal procedure in these cases has been carried over into the new century. Hofmeister, therefore, proceeds to give the experience with the resection method at the Tübingen Clinic within the last four years.

He reports a series of twenty-six cases with gangrene of the incarcerated loop of intestine. Seventeen of these were treated by primary resection of the intestine, with 4 deaths—23.5 per cent.; 5 with artificial anus, with 4 deaths—80 per cent.; 4 with transposition of the suspected loop, with 3 deaths—75 per cent. Hofmeister gives two lists, one of 167 cases, in which an artificial anus was established by Maydl, Krönlein, Körte, v. Bramann, Czerny, and others, with 101 deaths, or a mortality of 60.5 per cent; the other comprising 214 cases of primary resection, by the same operators, with 99 deaths, or 46.3 per cent. Mikulicz counts 72 deaths in 94 cases of artificial anus, or a mortality of 76.6 per cent., and 32 out of 68 primary resections, or 47.1 per cent.

Of the 17 cases treated by resection at Bruns' clinic 11 were women and 6 men. Fourteen were crural herniæ (10 women and 4 men), 3 inguinal hernia (2 men and 1 woman)—a distribution which would confirm the generally accepted fact that crural hernia not only furnishes a predisposing cause for incarceration, but also for early gangrene of the intestine.

¹ Beiträge z. klin. Chir., 1900, vol. xxviii., p. 671.

As regards the general conditions that are of interest in connection with the result of the operation, the ages of the patients should perhaps be first considered. Of the 13 cases that were cured by primary resection 2 were between twenty and thirty years old; 2 were between thirty and forty years; 3 were between forty and fifty years; 3 were between fifty and sixty years; 3 were between seventy and eighty years.

The four patients who died were all aged sixty years and over. Incarceration had endured for one-half day in 1 case, one day in 5 cases, one and a half days in 3 cases, two and a half days in 1 case, five days in 1 case, and six days in 2 cases, in the patients who were cured. In the cases that died it had lasted three days in 1 instance, eleven days in 2 instances, and ten days in 2 instances.

In 10 cases in which operation was done not later than two and a half days after incarceration there was no death. In the 7 cases in which it had existed from three to ten days prior to operation there were 4 deaths, or 57.1 per cent.

A point of great importance is the condition of the proximal section of the intestine. Upon the proper judgment of this depends the fate of the patient. It is the most responsible and difficult task of the surgeon during the entire operation.

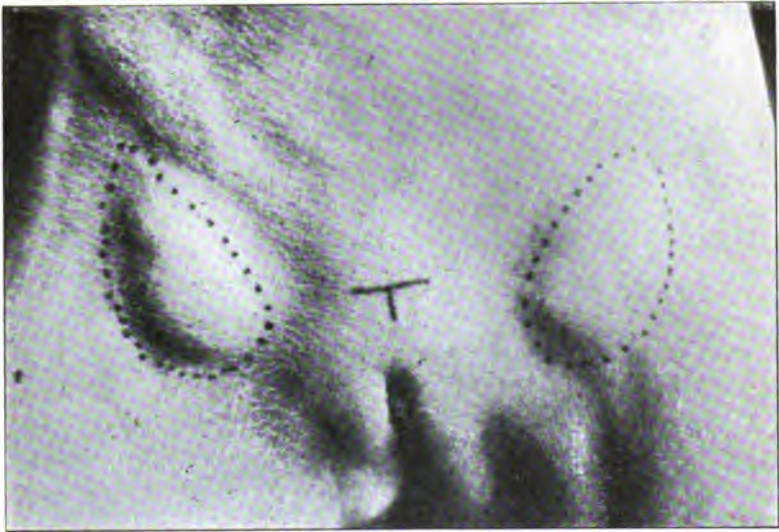
As regards indication, Hofmeister says that the more the conditions preponderate that make the saving of the patient at all possible the more strongly justified does he feel in doing primary resection. The decision to establish an artificial anus is almost equivalent to an admission that the case is hopeless.

In conclusion, Hofmeister enumerates the conditions which are considered most favorable as regards securing a good result from primary resection in gangrenous hernia:

1. Avoiding of general narcosis in herniotomy (infiltration anaesthesia).
2. Employing the broad herniolaparotomy as soon as the necessity for resection has been determined.
3. Extensive resection (the more so the longer the incarceration has lasted and the more pronounced the changes in the afferent loop), and if, after opening of the lumen, the mucosa seems suspicious, further resection should be done.
4. Emptying of the intestine during operation.
5. Lateral union of intestines.
6. Reposition of the sutured loop under control of the eye, in order to avoid sharp kinking.
7. Abstaining from radical operation and after-treatment with Mikulicz's tamponade as soon as the condition of the submerged loop or of the peritoneum seems suspicious, particularly if a distinct exudation was found during operation.

Crural Hernia. A. Narath¹ describes a peculiar form of crural hernia observed by him in connection with the bloodless treatment of congenital dislocation of the hip-joint. He states that this method, although called "bloodless," may involve greater risks for the patient than many of the bloody operations. He refers to paralyses, pareses, atrophies, and fractures that may occur as a consequence of mechanical injury done to the nerves and muscles during the resetting manoeuvres, and regrets that he is able to add to this "register of sin" another factor. He refers to a peculiar form of crural hernia which he has observed to appear some time after reposition. So far he has

FIG. 6.



Crural hernia following reduction of congenitally dislocated femurs. (NARATH.)

noticed it six times in sixty-five dislocated hip-joints (9.2 per cent.), but does not believe this gives a fair idea as to the frequency of the hernia, since many of his patients are still in plaster bandages. He feels sure that in one of these latter cases—a girl, aged four years, with double dislocation—the first phenomena of a beginning hernia are present. This would make 8 out of 65 hip-joints, or 12.3 per cent.

All the cases observed present one and the same type. They begin as a slight, elongated protrusion immediately below and parallel with Poupart's ligament. The protrusion is not noticeable ordinarily and only becomes discernible on coughing or straining, and this is the reason

¹ Arch. f. klin. Chir., 1899, vol. lix., No. 2.

why it is generally not discovered until it has reached some size. The hernia descends in front of the femoral veins and arteries and the crural nerve. Its outline is peculiar, resembling more or less the segment of a circle whose string corresponds to Poupart's ligament and whose bow is turned downward. The string of the bow, or the base of the hernia, is always rather wide—a fact which Narath considers typical as compared to other crural herniæ. The approximate measurements in his six cases were 7, 6.8, 5.8, 5.6, 5.3, and 5.4 cm. Mesially the hernia extends to or very near to Gimbernat's ligament; laterally it extends to about the middle of the space between the artery and anterior superior spine. The height of the segment or the greatest width of the hernia was 4, 3, 4.2, 4, 3, and 2.8 cm. As a rule, the protrusion is not very great. (See Fig. 6.) The hernial opening lies under Poupart's ligament and is probably very narrow, as the writer did not succeed in entering the same with his finger.

Another exceptional feature is that these herniæ occurred in children between the ages of six to eleven years, while ordinary crural herniæ are very rarely seen in children.

A further peculiarity is that these herniæ are generally empty, becoming filled only on straining or coughing, thus showing that the natural elasticity of the soft parts is sufficient to push back the contents.

From the foregoing description it will be seen that these cases represent a special type of crural hernia, well characterized by form, location, and other peculiarities. They are true prevascular herniæ.

Hernia Associated with Appendicitis. Friedrich Tacke¹ reports a case of epityphlitis in the hernial sac observed at Prof. Garré's clinic, Rostock. At first the patient noticed a small nodule in the right inguinal region, which could be easily removed by massage. Outside of severe diarrhœa there were no symptoms. After three months the nodule suddenly increased to a very large, exceedingly painful tumor, filling up not only the right inguinal region but also the scrotal sac. General health was poor, and high fever, vomiting, persistent diarrhœa, and passage of gas were present. There was a large, exceedingly painful inguinal hernia, with the appendix in the scrotal sac. Operation showed that the increase in the size of the hernia was caused by the entrance of the cæcum; the symptoms, however, were caused by the incarceration of the appendix. The cæcum was found intact, but the appendix presented a purulent infiltration and a perforation at its tip.

Briançon and a few others have published similar cases. In one of Sonnenberg's cases a very interesting condition was found at autopsy. In the left scrotum of a patient who had apparently died of chronic

¹ Beiträge z. klin. Chir., vol. xxix., No. 1.

peritonitis, several loops of small intestine, ascending colon, cæcum, with appendix, were found; the latter was gangrenous and perforated at different points, but did not contain any foreign body. The intestines in the hernial sac, as well as in the abdominal cavity, were agglutinated by fibrinous material.

Although in all the cases referred to it was not the appendix alone that was found in the hernial sac, yet all the symptoms observed were due to the appendix, since the other organs in the sac were found healthy, or, if diseased, it was clear they had become so by infection. Tacke states that cases where the appendix alone is contained in the hernial sac, either perforated or otherwise, are by no means rare. He appends a report of sixteen such cases collected from the literature. It is a remarkable fact, he states, that 9 of these 16 cases were crural hernia, 6 inguinal, and 1 obturator. This gives a high percentage of crural hernia, considering that the generally accepted proportion of the latter to inguinal hernia is 10 to 80. The reason, however, is evident. It is found in the narrowness of the crural canal, into which, of course, no other part of intestine could so easily enter as the thin, stretched appendix. I have found the appendix in the hernial sac in about ten cases, but in all the hernia was of the inguinal variety. In one case it was left inguinal.

Tacke adds that in none of the cases referred to was it possible to make an exact diagnosis as to the presence of the appendix in the hernial sac before operation. He thinks this will always remain most difficult, but believes that in case of a small hernia not presenting any distinct strangulation symptoms—especially if it be a right inguinal or crural hernia—one should suspect the presence of the appendix.

Congenital Umbilical Hernia. The subject of congenital umbilical hernia, or hernia of the cord, has been very carefully studied by H. E. Safford,¹ of Detroit, Mich. Safford reports a case recently operated upon by Dr. Robbins, of Detroit. The child was born on July 16, 1899, weighed eight pounds, and was well developed with the exception of a large hernia of the cord. The tumor was of dark red or purplish color, 30 cm. in circumference, with a pedicle 19.5 cm. The protrusion over the plane of the abdomen was between 5 and 6 cm. The intestines were plainly visible through the membranes and could be largely, if not completely, reduced without affecting the circulation or breathing. The upper portion of the contents, presumably liver, could not be reduced. Operation was performed thirty hours after birth, under chloroform anæsthesia. A median incision through the sac was made, showing the stomach and spleen at the hernial opening, with the portion of the liver in the upper part of the sac not adherent.

¹ Philadelphia Medical Journal, February, 1901, p. 393.

Intra-abdominal pressure was very great, and so long as the external opening was large enough even for examination it was almost impossible to control eventration. It was decided that it would be unwise to attempt resection, as had been planned, before suturing. The wound edges were brought together and antiseptic dressing applied. The child recovered from the shock of operation, but peritonitis developed and death occurred four days later. No autopsy was obtained.

Safford has made a very careful study of the literature of congenital umbilical hernia and has collected 90 cases. Up to 1882 expectant treatment was the almost universal rule. Lindfors, who collected the cases prior to 1882, found 34 cures; in only 2 of these had a radical operation been performed. The expectant treatment at this early period consisted in some form of protective dressing to aid, first, in the support of the tumor; and, secondly, in preventing gangrene of the outer membrane before the granulations had enclosed the peritoneum. Operative treatment began when the reduction of the hernial contents was followed by a small, circular ligature. A purse-string suture around the neck of the hernia was another step in advance, and still another was the operation described by Breus, designated as percutaneous ligature. Lindfors' second table, published in 1893, contained 31 cases reported prior to 1891. Hallet, of Paris, in June, 1900, published all the cases occurring since 1893.

A summary of the 90 cases collected by Safford shows that in 64 cases radical operation—laparotomy, freshening the wound edges, and suturing—was performed in 64 cases. Of these 42, or 65.6 per cent., healed and 21 died; in 1 the result is unknown; simple ligature in 1 case, which recovered; percutaneous ligature in 3 cases, with 1 recovery and 2 deaths. The extraperitoneal operation of Olshausen was employed in 5 cases, all of which recovered. Combining these, the total number of operative cases is 73, with 67 per cent. of recoveries. Expectant treatment was employed in 15 cases, with 7 recoveries, or 47 per cent., and 8 deaths. The total number collected between 1882 and 1900 is 90. Safford states that a striking fact brought out by these results is the percentage of cases that healed after Olshausen's operation—namely, 5, with no mortality. Olshausen's report appeared in 1887, and the chief advantage of his procedure we believe to be the fact that the peritoneal cavity is not opened. An oval incision is made through the skin edge near the base of the tumor and carried down to the peritoneum. The edge of the skin toward the hernia, together with the outer membrane covering the hernia, was separated from the underlying sac of peritoneum. The interposed mucous tissue, or Horton's jelly, is removed until the peritoneum is freed as much as possible from all adherent tissue. It is then gathered into folds by a few stitches to

obliterate the cavity, and the whole is dropped into the abdominal wound and the edges drawn together over the opening and sutured with silk.

In commenting on this method Safford states that it is admitted to be applicable to those cases where a large hernial opening makes the eventration difficult to control. It lessens the probability of death from peritonitis and makes a smaller cicatrix than would result from expectant treatment. While it saves the life of the patient in these cases, he says, it can scarcely be said to have cured the hernia. In nearly every case reported the course had been failure of union, suppuration, and finally a cicatrix which, after healing and contraction were complete, admitted a limited protrusion of the bowel.

In this connection I would state that the after-history of one of my patients, aged 22 hours, operated upon in July, 1899, for a very large congenital hernia of the cord, the size of a large orange, inclines me to strongly favor the extraperitoneal method. While I had never seen the operation of Olshausen described, the operation I performed in this case was practically identical with his. The skin edges were brought together as closely as possible with silkworm-gut sutures. Suppuration did not occur, and the resulting cicatrix gradually contracted until with the aid of carefully and constantly applied bandages the child at present shows an almost complete cure of the hernia. I believe that had the peritoneum been opened, aside from the greatly increased danger from peritonitis, the result as regards radical cure would have been no better.

Hallet emphasizes the importance of intervention as soon as possible after birth, and his table, prepared according to the interval of time elapsing between birth and operation, shows the great importance of early operation. In 58 cases operated upon within thirty-six hours after birth the mortality was only 26 per cent.; in 7 cases operated upon within forty-eight hours after birth the mortality was 43 per cent.; in 2 cases operated upon the third day after birth the mortality was 50 per cent.; in 4 cases which were operated upon after the third day it was 100 per cent.

In my second case, operated upon also in July, 1899, the hernia was so large, containing practically the whole liver and stomach and a large portion of the intestine, that there was not sufficient space in the abdomen to permit of reduction. After removing several ounces of fluid the wound was closed and pressure applied. The after-history of this case I have been unable to trace. The child was alive three weeks later.

HERNIA VAGINALIS. Rose¹ reports a very rare case of acquired irreducible anterior hernia vaginalis in a pregnant woman. The pregnancy was, however, detected only during operation. It was found that the hernial sac had been formed by the growing pregnant uterus

¹ *Deutsche Zeitschrift für Chirurgie*, August, 1900, vol. lvi.

pushing the bladder off the cervix. The sac contained the base of the pregnant uterus, which forced the hernial sac into the vagina.

On March 12, 1900, eleven months after leaving the hospital, the patient was presented before the Free Association of the Surgeons of Berlin; the 16 cm. scar was found solid and the patient in perfect health.

Grosse,¹ in an article entitled "The Radical Treatment of Inguinal Hernia," speaks of the great annoyance of thread infection in the buried sutures, which not only delays healing but no doubt also has an unfavorable influence upon the final result. He believes that this is due not altogether to the suture material, but also in part to deficient nutrition of the fascial tissues instrumental in forming the hernial sac and its mouth. It is clear, he says, that methods which require numerous sutures, as Bassini's, will be most likely to cause necrosis of the tissue. On the other hand, in the methods which require fewer sutures but make greater demands upon the vitality of the hernial sac, necrosis has been observed. After trying a number of methods Landerer, of the Karl-Olga Hospital, Stuttgart, has been led to introduce a modification of Kocher's method, the results of which he thinks have been more satisfactory than those of any other method. In looking over the literature it was found that the same procedure was already followed by Charles B. Ball and described in the *British Medical Journal*, 1898.

So far seven cases have been operated upon by the modified Kocher method at the Karl-Olga Hospital, with 14.3 per cent. suppuration. Five of these were traced, and, excluding one case which recurred, owing to special causes, all were cured, although the time of observation (one-half to two years) is perhaps too short for such a claim; yet since all the cases formerly operated upon, according to Kocher, remained free from recurrence, the same may be expected of these in which the healing was far more satisfactory. This series of cases is too small to warrant conclusions. Under present aseptic methods suppuration ought not to occur in more than 2 or 3 per cent. of cases of operation for the radical cure of hernia.

SURGERY OF THE INTESTINES.

Acute Intestinal Obstruction and Gangrenous Hernia. Gibson,² of New York, has collected a sufficiently comprehensive series of cases operated upon between 1888 and 1898 to give us an approximately accurate idea of the results under modern conditions. An attempt is

¹ *Deutsche Zeitschrift für Chirurgie*, September, 1900, vol. lvii.

² *Annals of Surgery*, October, 1900.

made to draw a sharp distinction between acute and chronic cases. No cases have been included in the table "in which a new-growth or extra-intestinal inflammatory process was a factor, contributory or direct."

With the exception of 75 cases from the Russian and Italian literatures, all the cases were read in detail by the author. The cases of gangrenous hernia demanding direct interference are included with the cases of acute intestinal obstruction. The classification was as follows :

Hernia	354 cases.
Intussusception	187 "
Bands	186 "
Volvulus	121 "
Meckel's diverticulum	42 "
Gallstone	40 "
Openings	34 "
Foreign body	16 "
Miscellaneous	20 "
Total	1000 cases.

There were 646 cases of intestinal obstruction, with 312 deaths, or a mortality of 47 per cent. Dividing the cases into decades it was found that the largest number of cases—28 per cent.—occurred in the first decade ; 14 per cent. in children under one year.

There was little difference in the liability of the two sexes to these lesions. Of 882 cases, including hernia, 472 were male and 410 female. Taking only the cases of intestinal obstruction, 65 per cent. were males, while of the hernia cases only 34 per cent. were males. The mortality in the sexes showed considerable difference. Of the total cases of hernia and intestinal obstruction the female mortality was 37 per cent. against 63 per cent. in the male. An analysis of the two groups, however, shows that the female mortality in obstruction was 33 per cent., while in the male it was 54 per cent. The conditions are nearly reversed in the hernia cases, the mortality being from 28 to 40 per cent. in the female.

Gibson's explanation is probably correct, that the higher mortality in hernia is due to the fact that a larger proportion of the cases are femoral hernia, in which the damage to the intestine is usually greater than in inguinal hernia.

The results of primary resection and enterorrhaphy in intestinal obstruction as compared with the results of artificial anus are interesting and instructive. The mortality of primary resection in 32 cases of intussusception is 81 per cent.; in 17 cases of bands, 47 per cent.; in 16 cases of volvulus, 81 per cent.; in 5 cases of Meckel's diverticulum, 80 per cent. The results of similar cases treated by the method of artificial anus show in 24 cases with intussusception a mortality of 79

per cent.; 22 cases with bands, a mortality of 95 per cent.; 20 cases with volvulus, a mortality of 80 per cent.; 4 cases with Meckel's diverticulum, a mortality of 75 per cent.

Gibson has collected 187 cases of intussusception, of which 126 cases were treated by reduction, with a mortality of 36 per cent. These cases were all acute. In 34 cases treated with artificial anus the mortality was 83 per cent. In 32 cases treated by primary resection the result was 31 deaths, only one case being saved. The mortality rises rapidly with the length of time the intussusception has existed. Of 36 operations done on the second day the mortality was 39 per cent.; of 33 on the third day it was 61 per cent.

These tables of Gibson show the grave risks resulting from delay. On the first day the percentage of reducible cases was 94 per cent., whereas on the third day only 20 cases could be reduced. The cases operated upon on the fifth and sixth day show a mortality of 73, or 75 per cent.

Of 186 cases of acute obstruction due to bands 76 died, giving a mortality of 41 per cent. In 17 cases treated by resection the mortality was 52 per cent.; in 4 cases treated by resection and artificial anus the mortality was 100 per cent.; in 18 cases treated with artificial anus alone the mortality was 94 per cent.

Forty-two cases were operated upon for obstruction due to Meckel's diverticulum, with 23 deaths, or 62 per cent. The diverticulum was divided or excised in 30 cases, with a mortality of 57 per cent.; resection was employed in 5 cases, with a mortality of 80 per cent.

In 40 cases with obstruction due to gallstone the mortality was 57 per cent. A great preponderance of these patients were females, the proportion being 27 to 9.

In 34 cases of obstruction due to openings, including diaphragmatic hernia, the mortality was 62 per cent.; the 6 cases of diaphragmatic hernia all died.

In 16 cases in which the obstruction was due to foreign bodies the mortality was 25 per cent.

An analysis of the cases of gangrenous hernia is of special interest. Gibson collected 354 cases, of which 120 died, giving a mortality of 34 per cent. Of these 123 were males, with a mortality of 28 per cent.; 209 females, with a mortality of 39 per cent. The ratio of inguinal to femoral hernia was as 1 to 2 for the entire series, while it was 12 inguinal to 5 femoral in the male and 1 to 15 in the female.

The mortality for gangrenous hernia in the female was slightly higher in inguinal, being a proportion of 4 to 3.

Among the operations for gangrenous hernia 188 were femoral hernia, with a mortality of 37 per cent. The mortality in males

was 33 per cent. and in females 38 per cent., the ratio of males to females being 1 to 5; 22 cases were umbilical and 2 ventral hernia, and the mortality in these cases was 67 per cent. The probable explanation for this high mortality is that the patients are usually stout women with flabby abdominal walls and little resisting power. Unusual difficulties are encountered in this class of cases, due to the large amount of intestine or omentum in the sac and the extensive adhesions. Gibson states that one operator removed 446 cm. of small intestine. Autopsy showed that the small amount of small intestine that remained was also gangrenous—that is, the operation had not been sufficiently radical. In another case 225 cm. were resected; this case also was fatal. One in which 186 cm. were removed recovered. There were 7 cases of obturator hernia, with a mortality of 86 per cent.; five cases were treated by laparotomy, in two of which the intestine was reduced, with the result that both patients died of gangrene of the gut. The three patients operated upon by the method of artificial anus all died. Of the three resections one recovered.

Gibson's tables of gangrenous hernia are extremely valuable, inasmuch as his is the first large collection of selected cases operated upon in recent years.

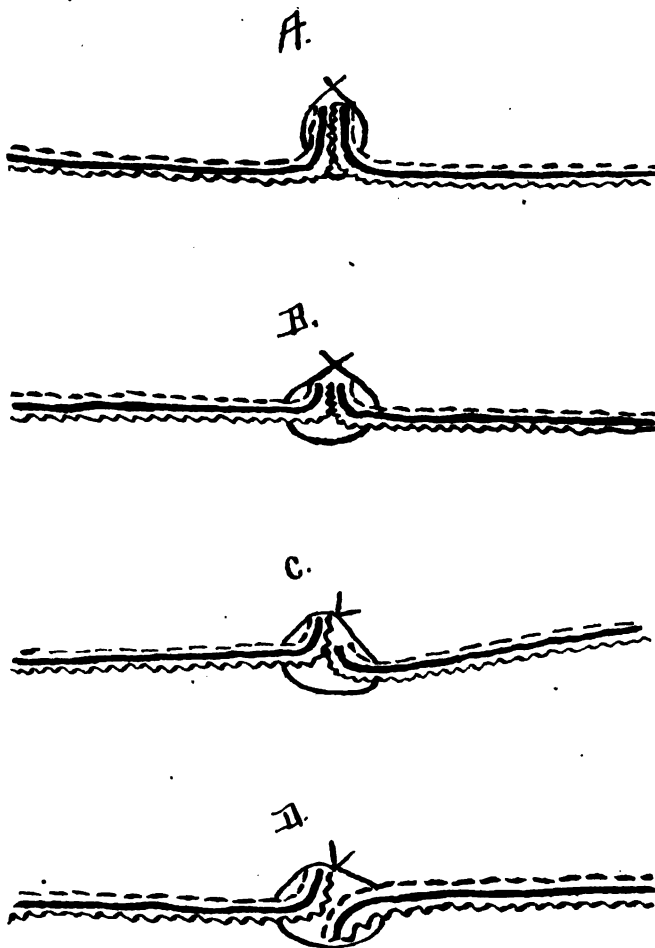
The combined statistics, including the different varieties of hernia, show 354 operations for gangrenous hernia, with a total mortality of 34 per cent.; 226 cases were treated by resection and immediate reunion of the intestine, with a mortality of 26 per cent.; 30 cases treated with resection and artificial anus gave a mortality of 50 per cent.; 71 cases treated with artificial anus without resection showed a mortality of 53 per cent.; 20 cases were treated by the method of invagination of the gangrenous portion, with a mortality of 14 per cent.

Gibson's series of cases shows a decided decrease in mortality compared with earlier statistics. Frank's series of 227 resections prior to 1893 show a mortality of 47 per cent. Zeidler's statistics, published in 1892, show 289 cases, with a mortality of 49.13 per cent. In 287 cases treated by artificial anus the mortality was 74.22 per cent. Gibson has analyzed 300 resections with primary enterorrhaphy, with reference to the methods of operation: 195 were operated upon by suture, without mechanical aids, with a mortality of 38 per cent.; 94 operated upon by mechanical aids of various kinds showed a mortality of 36 per cent. In 76 of these the Murphy button was used, with a mortality of 30 per cent. The superiority of the Murphy button is shown both in the cases of intestinal obstruction and in gangrenous hernia, although, as Gibson points out, these advantages are too small to have much importance. Gibson believes that the narrow margin between the results in the method of suture and the

button must be further analyzed. Notwithstanding his personal preference for the suture method, he believes that the difference in favor of the Murphy button is actually much more marked than his statistics show. His reasons for this view are :

1. Since the introduction of the Murphy button the method of suture has generally been restricted to the more favorable cases, even in the hands of most skilful surgeons.

FIG. 7.



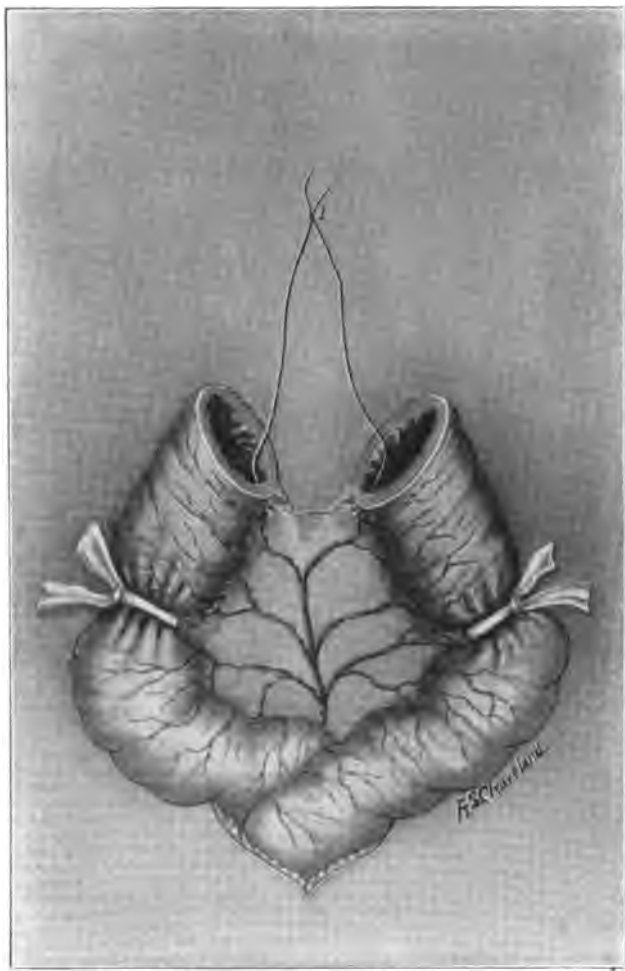
Connell's anastomosis. (MARTIN.)

2. In unskilled and inexperienced hands he believes the Murphy button yields better results both as regards saving of life and recovery without fistula.

3. The use of the Murphy button extends the field of resection.

Gibson's statistics show that in 12 cases of gangrenous hernia death was due to insufficient removal of the bowel. That enormous amounts of intestine may be resected without endangering life or nutrition is shown by the statistics of Rocci and Fantino, who successfully resected

FIG. 8.



Connell's method of anastomosis. Method of inserting mesenteric stitch. (MARTIN.)

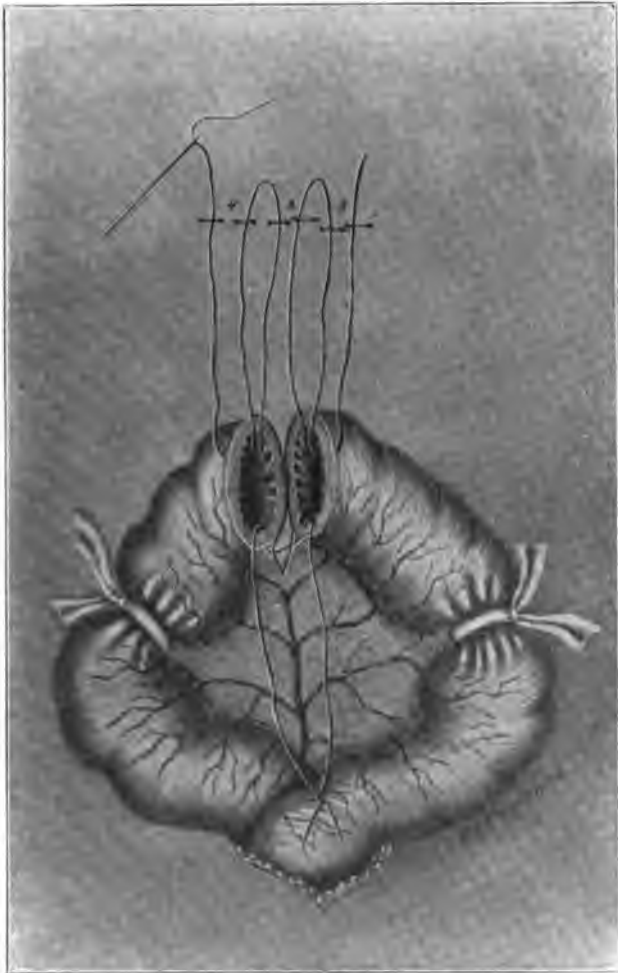
310 cm. (10 feet 4 inches). There were 6 cases in which more than 100 cm. were removed. In comparing the various methods of intestinal suture Gibson considers it strange that the typical Mannsall method, which is so easy, rapid, and certain, is not oftener used in intestinal resection for acute conditions.

Of 15 cases treated by lateral anastomosis 7 died.

In regard to the anæsthetic used he states that chloroform was used in 180 cases, with 72 deaths; ether in 72 cases, with 32 deaths.

End-to-end Anastomosis. Martin,¹ of Chicago, reports in detail a case of Connell's operation of end-to-end anastomosis of the small intes-

FIG. 9.



(CONNELL.)

tine. This is the first case in which this method has been performed on the human subject. Figs. 7 to 18 show very clearly the method by which the suture is applied. Martin states that this method is easier to execute than to describe, and he suggests that it be first practised on

¹ Journal of the American Medical Association, November 3, 1900, p. 1151.

a dog before attempting it on the human subject. It consists in a modification of Maunsell's procedure, the original feature being an ingenious method of tying the last suture in such a way that all the knots are in the mucous membrane of the bowel. This is accomplished without making the usual extra incision employed in Maunsell's opera-

FIG. 10.



(CONNELL.)

tion. The suture includes all the coats of the bowel, and yet no sutures are visible between the approximative serous surfaces. Maunsell believes that this method has all the advantages of the Murphy button with none of its serious faults. The actual time consumed for anasto-

mosis in Martin's case was between fifteen and twenty minutes. The patient made an uneventful recovery.

Fifteen to twenty minutes cannot be considered a short time for intestinal anastomosis by the older methods of suture. Probably this time could be much shortened with greater familiarity with the method.

FIG. 11.



(CONNELL.)

It certainly seems to have advantages over both Murphy's button and the ordinary anastomosis by Lambert suture.

New Method for Forming Intestinal Anastomosis. Lee,¹ of Chicago, describes an intestinal holder for aiding in end-to-end suture

¹ *Annals of Surgery*, January, 1901, vol. xxxiii.

of the intestine. He states that it is an improved device for holding the cut ends of an intestine in position while they are being sutured. The instrument is so made that it can be easily adjusted to fit any intestine, and any tension can be given the parts during the operation. When

FIG. 12.



(CONNELL.)

the suture has been completed the instrument is made to collapse, thus permitting its easy withdrawal from the intestine through a small opening. The advantages of this method Lee believes to be :

1. That one instrument will fit all sizes of intestine.
2. That it permits the use of any method of suture.

3. That it avoids the necessity of preliminary retention sutures.
4. No assistants are needed to complete the suture.
5. There is no tendency to formation of a diaphragm during or after suture, the objection which is urged against the La Place forceps.

FIG. 13.



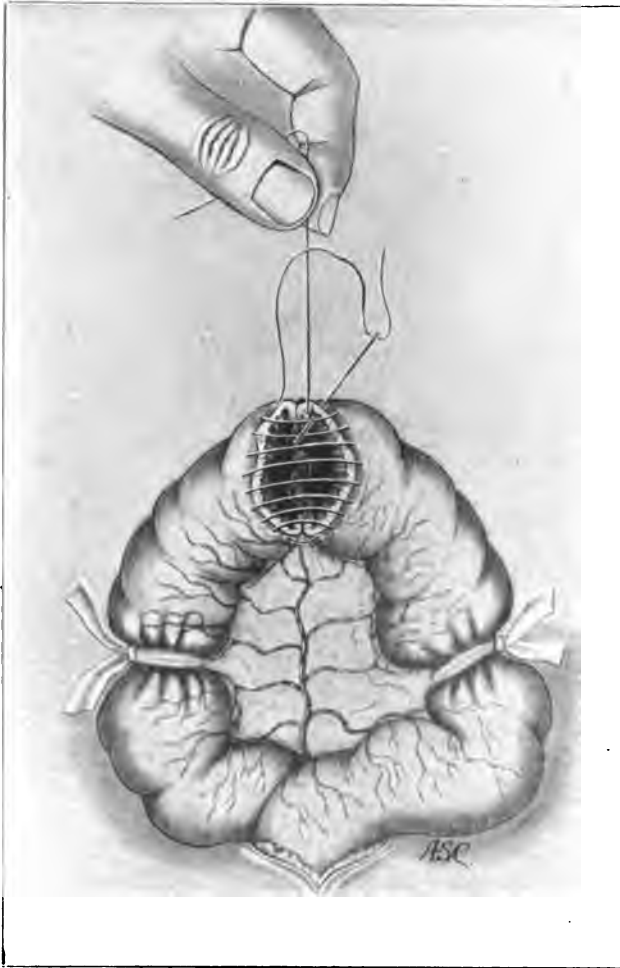
(CONNELL.)

The instrument is somewhat difficult to describe, and even with the excellent illustrations of Lee some study is required before one fully understands it.

The instrument consists primarily of two parts or pivoted arms, as shown in Fig. 19, forming when extended (Fig. 20) what the author terms

a "double cross," and so adapted that when in this position the cut ends of the intestine can be expanded over them. The arms are so constructed that they can be separated to fit any size of intestine. For a

FIG. 14.



(CONNELL.)

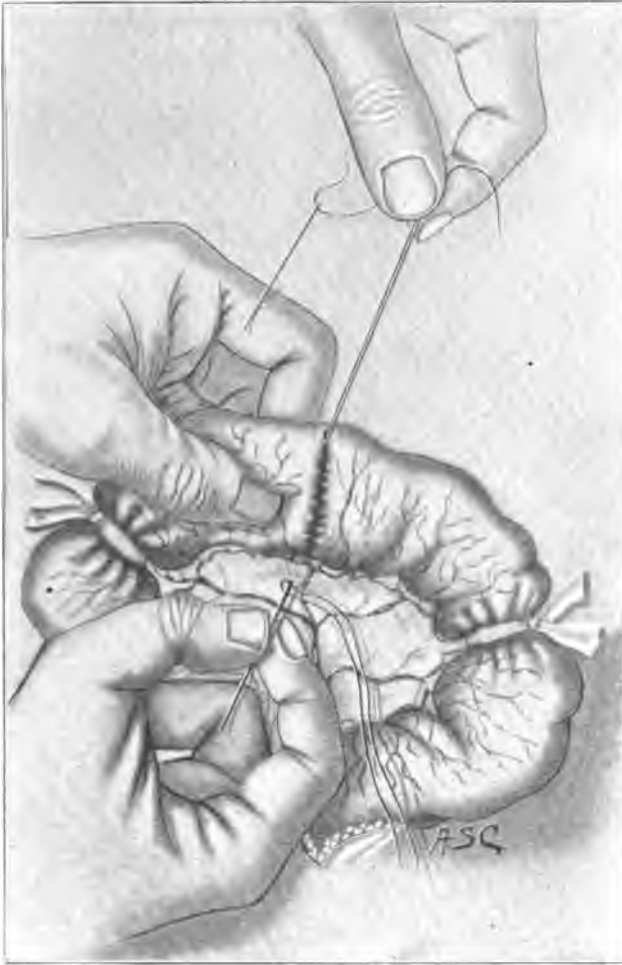
full technical description of the instrument the reader is referred to the original article.¹

In using this device the various parts are first brought to the position shown in Fig. 20; the arms are then separated to give proper tension to the intestine, when the ends are secured in the usual manner. To

¹ Loc. cit.

withdraw the instrument from the intestine the knob 11 is backed off the tube 8, which permits the arms to collapse toward and into the slot 5. As the stem is withdrawn from the intestine the arms take

FIG 15.



(CONNELL.)

the position as shown in Figs. 19 and 20 and then may be easily withdrawn.

With regard to the choice of sutures, Lee prefers the Connell stitch, or rather a slight deviation from the original method, the principle of the suture—namely, a single suture penetrating all coats of the bowel,

in which all the knots are placed within the lumen of the bowel. He, however, preserves the following :

1. The *mésenteric* stitch is inserted in a different manner, as shown in Figs. 21 and 22.

FIG. 16.



Insertion of last stitch. (CONNELL.)

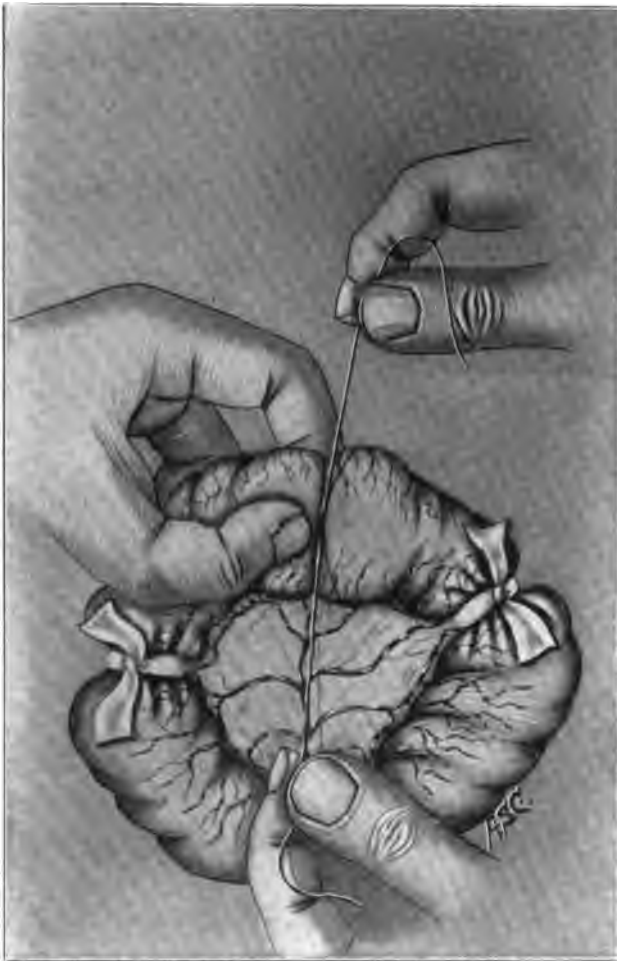
2. The suspending loops are dispensed with, so that only one thread is used throughout the entire procedure.

3. The bowel is divided in two sections by the holder instead of into three, as with the loops.

4. A continuous suture in place of an interrupted one. This, however, he regards as a matter of choice or convenience.

5. After the mesenteric suture has been tied the intestinal holder is introduced so that the distal arm is placed along its mesenteric border and the other arm, when holding the intestine in the proper tension, is directly opposite the mesenteric attachment, holding the intestine in a flattened condition, dividing it into two halves.

FIG. 17.



Tying last stitch. (CONNELL.)

Half the intestine is then sutured, with one of the protruding threads at right angles; a continuous suture is used, including all coats of the bowel. After the thread is pulled taught it disappears from view, assuming a subperitoneal position. As soon as the point is reached

where the stem of the holder protrudes from the lumen of the gut the final stitch, which is a half-stitch, is taken to the opposite side—a stitch from without in and one which remains in the gut; a stitch very close to the corresponding final stitch of the other side of the intestine,

FIG. 18.



Suture completed. (CONNELL.)

which also protrudes through the same end of the bowel. The instrument is now turned to the unsutured side, which is closed in the same manner as the first. The instrument is then made to fold, and withdrawn as already described. The final knot is then tied according to the method of Connell. This method is well shown by Figs. 23 and 24.

A needle armed with thread is inserted, eye first, from the opposite side, in the line of the previously tied stitches, and made to present near the two ends of the stitch to be tied. The thread of the eye of the needle is then loosened to form a loop, through which the end of the inserted stitch is passed. The needle, with its thread, is then withdrawn, bring-

FIG. 19.

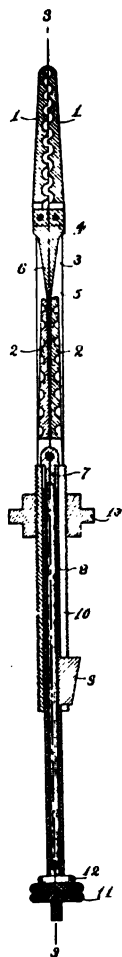


FIG. 20.

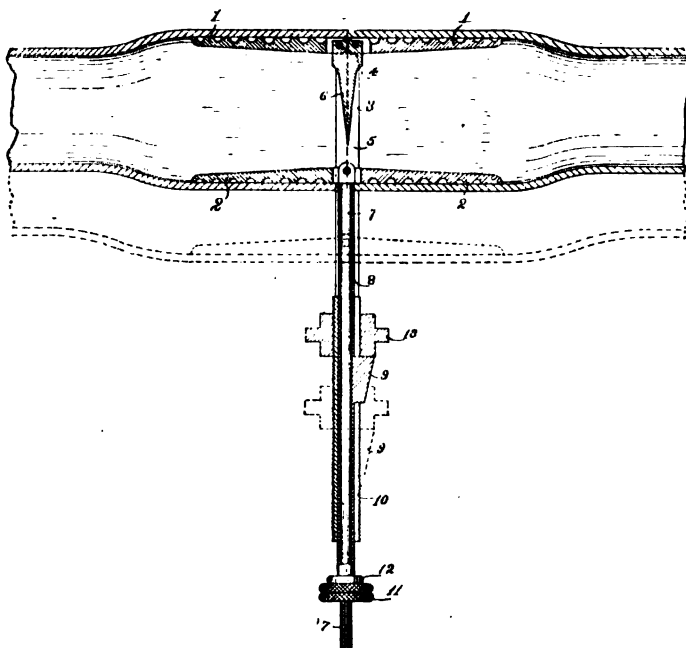


FIG. 19.—Section showing blades folded ready for withdrawal. (LEE.)

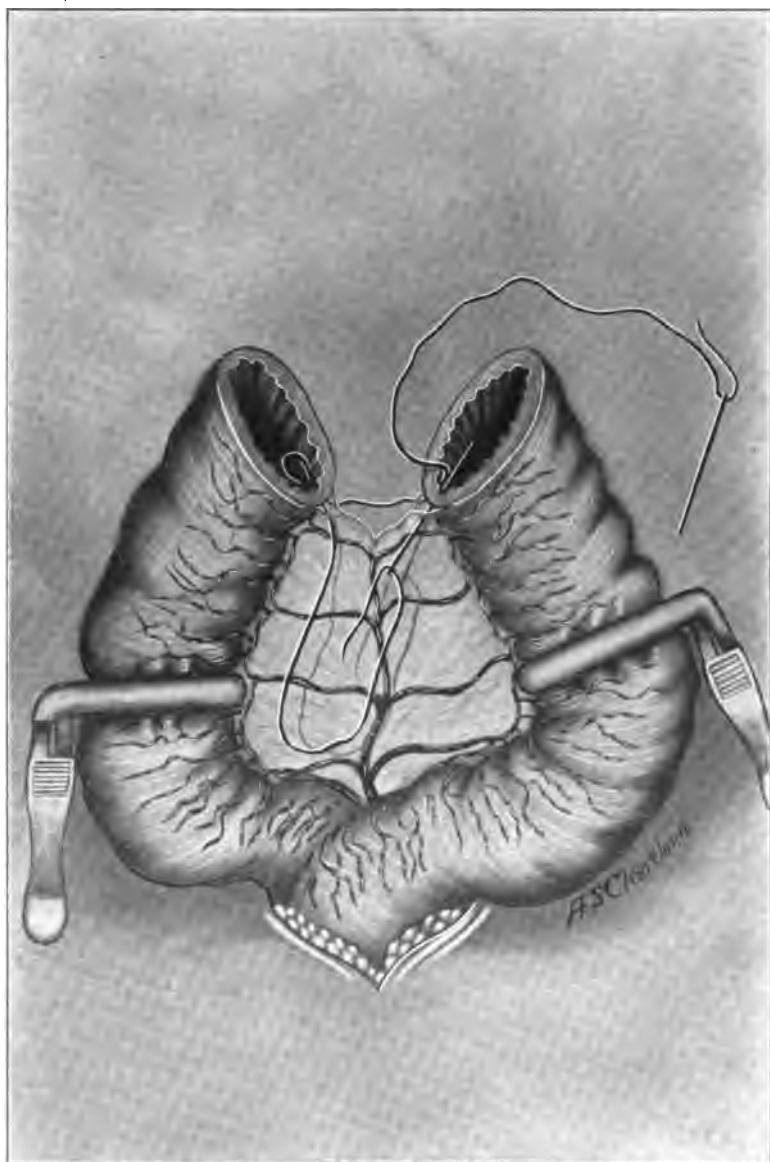
FIG. 20.—Longitudinal section of intestine holder within lumen of bowel. (LEE.)

ing with it on the loop two ends of the stitch to be tied (Fig. 25). Upon manipulating or slightly stretching the gut, after the final knot has been tied, it slips into the bowel in proper position.

This method has the advantage that all the knots on the mucous membrane and the suture are invisible from without.

Perforation in Typhoid Fever. Perforation and perforative peritonitis in typhoid fever is a subject of increasing surgical importance. Osler's recent paper¹ may be regarded as the latest and most authorita-

FIG. 21.

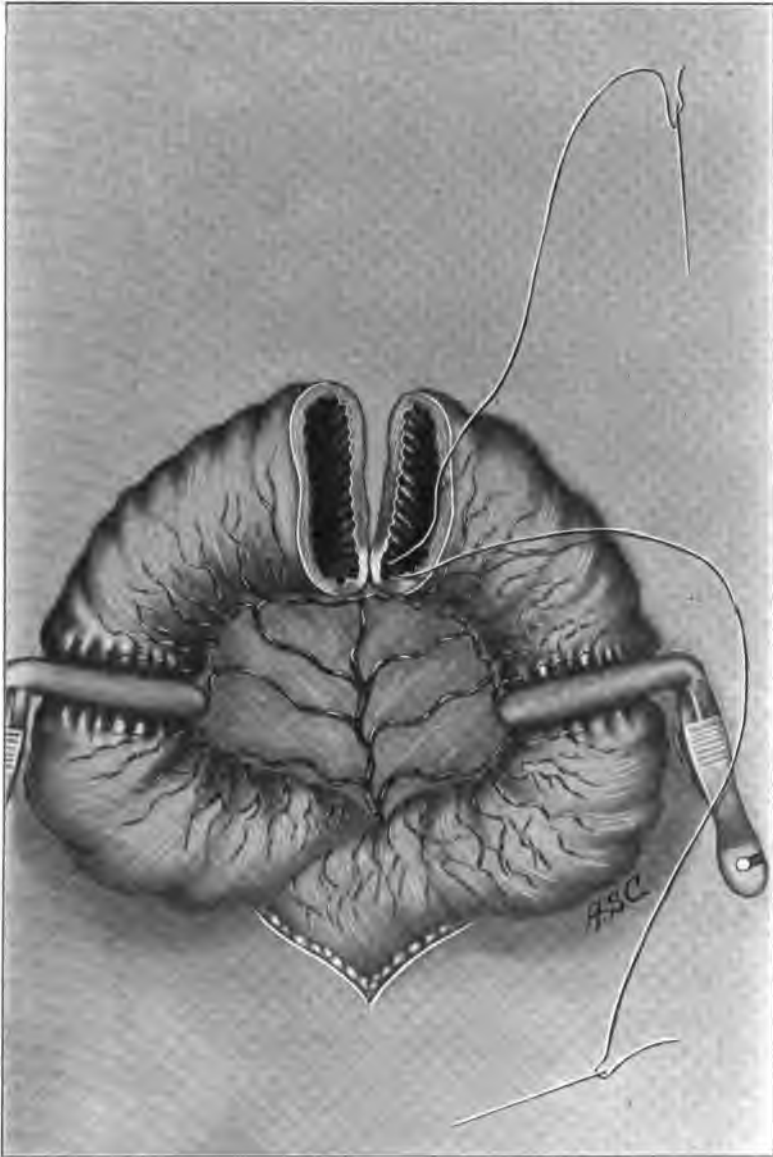


Method of inserting mesenteric stitch. (LEE.)

¹ Philadelphia Medical Journal, January 19, 1901.

tive. Osler believes that while there has been practically no reduction in the prevalence of typhoid fever in this country there has been a

FIG. 22.

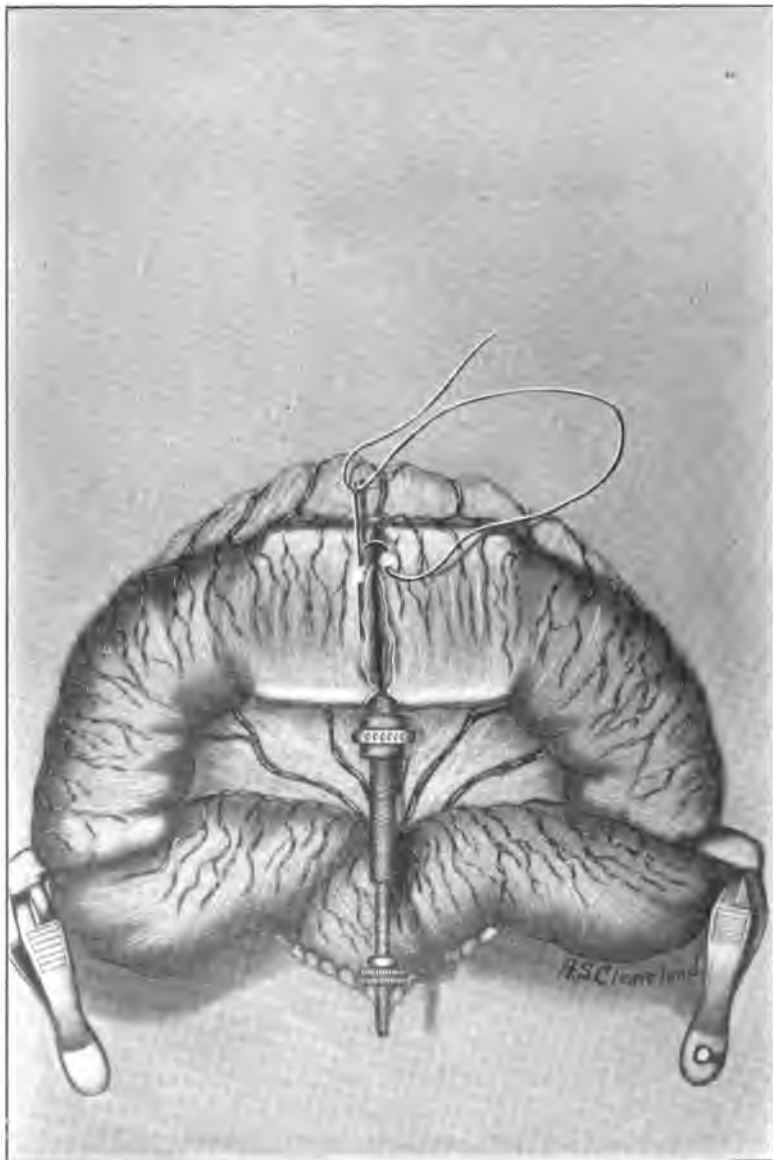


Mesenteric stitch tied. (LEE.)

striking reduction in the mortality of the disease, due to better nursing and better methods of treatment. He believes that from 5 to 7 per

cent. more patients recover than twenty years ago. Among 100 fatal cases 50 died of progressive asthenia, 30 of perforation, and 20 of other

FIG. 23.

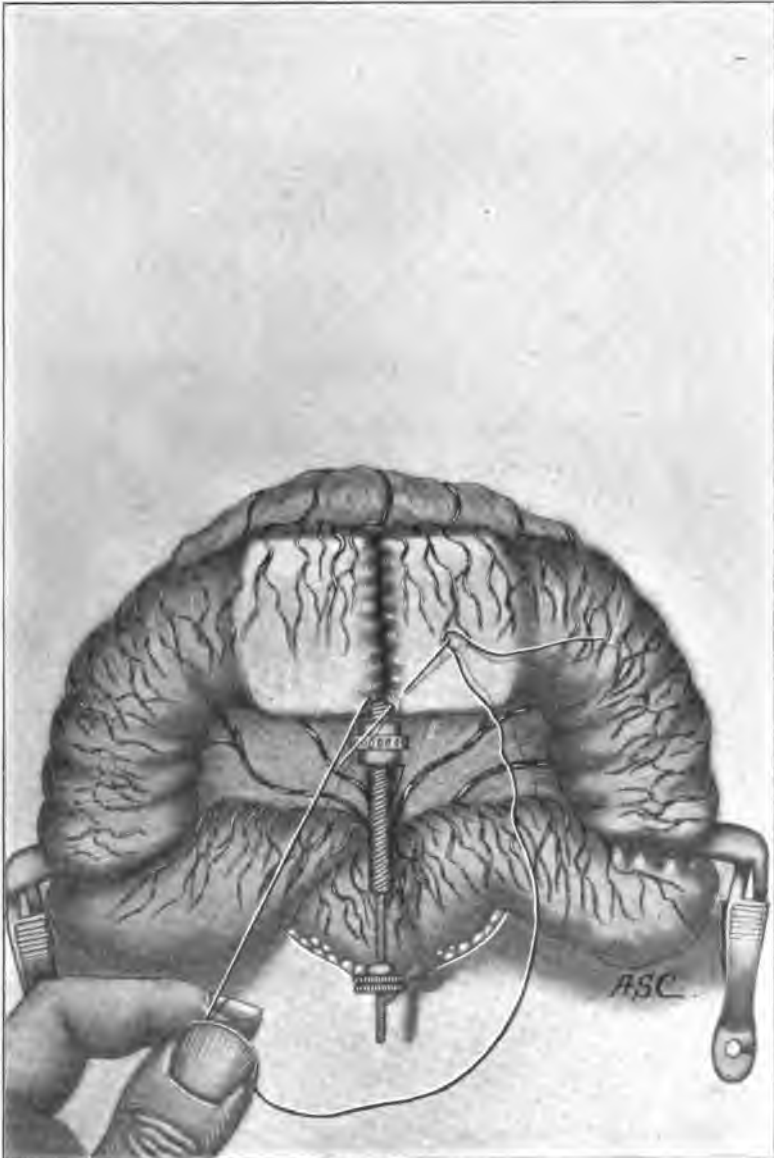


Holder inserted holding intestine in position. (LEE.)

complications. Of sixty-three deaths in the first ten years of work at the Johns Hopkins Hospital nearly one-third were due to perforation.

Fitz's statistics show practically no change in the percentage of cases of perforation. Osler states that the perforation is usually within eighteen

FIG. 24.

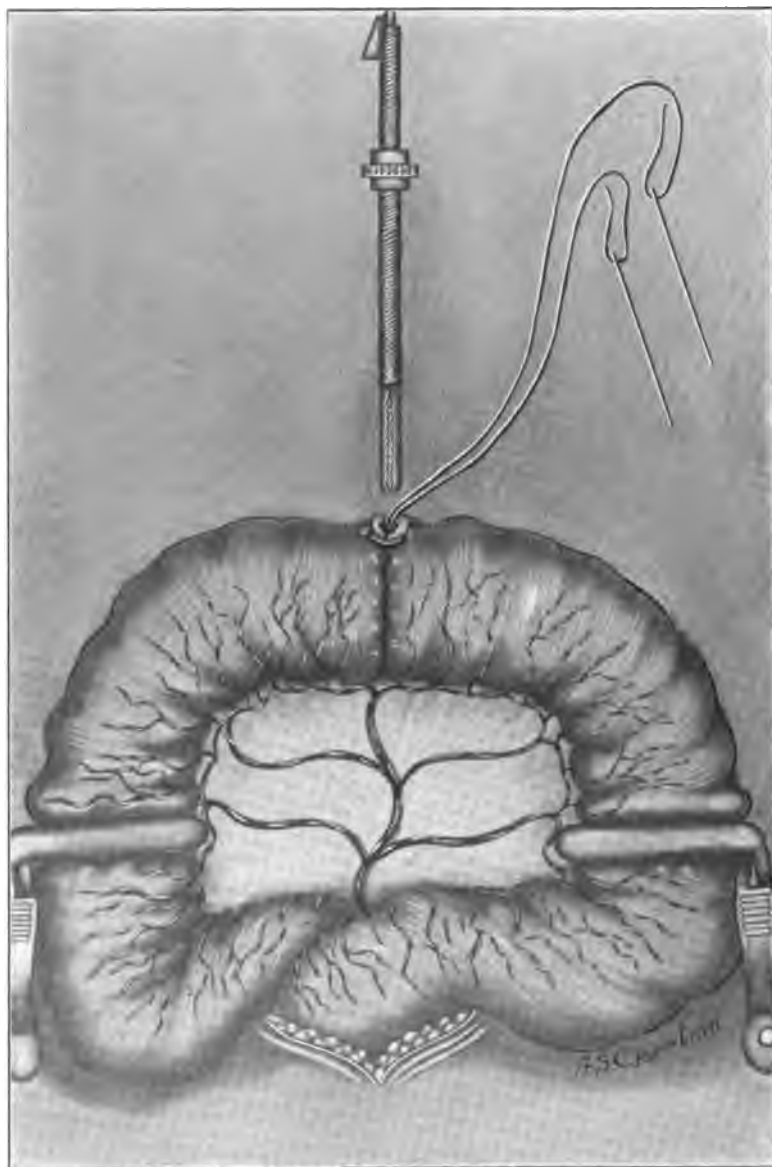


One-half intestine sutured ; needle in place for final stitch, first half. (LEE.)

inches of the valve. "The position of the terminal loops of the ileum make the first symptoms of perforation hypogastric and may give the

case a pelvic or an appendicular aspect." The majority of cases occur in the third week, and the earlier the perforation and the closer to the

FIG. 25.



Holder folded and withdrawn. (LEE.)

valve the more extensive will be found the necrosis of the mucous membrane, and hence the less favorable will be the conditions for surgical

treatment. Osler emphasizes the importance of more careful watching of the patient, in order to determine the earliest symptoms not of peritonitis but of perforation. He does not believe that we are likely to do much with Cushing's so-called pre-perforative state. The essential thing, he believes, in every serious case is careful watching by a man who will note every change in the patient's condition and at the same time be within immediate reach of surgical assistance. He believes that in three of the successful cases at the Johns Hopkins Hospital the patients' lives were saved only by the prompt action of Dr. Fitcher and Dr. McCrae and the equally prompt co-operation of the resident surgeon. Cases with diarrhoea and tympanites are more likely to have perforation. Of 30 cases at the Johns Hopkins Hospital 20 had diarrhoea—16 at the time of perforation—4 had constipation at the time, and in 10 the bowels were regular. Osler has drawn up a schedule of special instructions to be followed in cases of typhoid fever in which perforation is suspected. These are of sufficient importance to warrant giving them in full :

1. Instructions should be specific and definite to the night superintendent and head nurses to notify the house physician of any complaint of abdominal pain by the patient, of hiccup or vomiting, of a special rise of pulse or respiration, of sweating, or of signs of collapse.

2. House physicians should note the character of the *pain*. As to (a) *onset*, whether only an aggravation of slight abdominal pain, such as is common both with constipation and with diarrhoea, or whether it was a sudden, intense pain which caused the patient to call out, and which, though relieved by stupes and ordinary measures, soon recurred in paroxysms and grew worse. (b) *The locality*, whether diffuse or localized in the hypogastric or right iliac regions; radiation, as to penis. It is to be borne in mind that abdominal pain of a severe character may be associated with an acute pleurisy, with distended bladder, with cholecystitis, and with a packed rectum, or may follow an enema.

3. *State of the abdomen*. The condition to be noted in writing at once as to the following particulars :

- a. Whether flat, scaphoid, or distended. Whether, if distended, it is uniform or chiefly hypogastric.

- b. Respiratory movements, whether present, if uniform and seen both below and above the navel.

- c. Palpation, as to tension and pain, locality and extent, and degree of pressure necessary to elicit; muscle rigidity and spasm, whether present or not, and in which special locality, and noting particularly its absence or presence in the hypogastric region and the right iliac fossa.

- d. Percussion, character of note in front of abdomen and in flanks. Liver-flatness, extent, in middle, nipple, and in midaxillary lines. Note

specifically every third hour. Remember, too, that obliteration may occur in a flat as well as in a distended abdomen. Auscultatory percussion may be helpful.

e. Auscultation, obliteration of signs of peristalsis; presence of friction.

f. Examination of rectum, whether tenderness; fulness between rectum and bladder.

g. Stools, character, frequency, presence of blood, or sloughs.

4. *General condition of patient:*

a. Facies, whether change in expression; risus, slight or marked; pallor, sweating, etc.

b. Pulse, change in rhythm, rate, and force.

c. Temperature, whether a drop or not, whether after a tub or not.

d. Respiration, sudden increase, not infrequent, whether shallow or sighing.

e. Sweating, if subject to during attack; if onset with the pain; whether local or diffuse.

f. Vomiting, whether with onset of pain or not; character of vomiting.

g. Hiccough.

5. *Blood-count.* Leucocytosis, stationary or rising. May be marked and early. In a majority of well followed cases there is a rise. The constant leukopenia in typhoid fever has to be taken into account; also a count of the red blood-corpuscles and hæmoglobin, as a decided drop might suggest hemorrhage.

Up to January 1, 1901, 11 cases of perforation have been operated upon at the Johns Hopkins Hospital by Drs. Halsted, Finney, Cushing, and Mitchell, 5 of which, or 45.4 per cent., recovered; 5 additional cases have been operated upon by the same surgeons, with 1 recovery, giving a total of 16 cases, with 6 recoveries, or 37.5 per cent.

Subcutaneous Intestinal Injury. Kirstein, in a paper entitled "Contribution to the History of Subcutaneous Intestinal Injury," reports one case operated upon in December, 1889, by Prof. Eiselsberg which is interesting not only because of its favorable result, but principally because it shows in a very pronounced manner the one symptom to which much attention has been paid of late, and which alone is said to be highly characteristic of subcutaneous injury of the abdominal organs in general and of the intestine in particular. This symptom is the board-like tension of the abdominal wall. Kirstein states that if the future should show that this symptom may be looked upon as a classical one for intestinal injuries early diagnosis in such cases will be much facilitated. He appends a table of 18 cases of abdominal injury by blunt force operated upon by various authors between 1897

and 1899. It shows that 8 (44.5 per cent.) out of these 18 cases were cured and 10 (55.5 per cent.) died. Deducting 4 in which death occurred not as a direct result of operation the mortality is reduced to 6 (33.3 per cent.). In 4 cases laparotomy was done within the first five hours, and all were cured; of 3 cases operated upon from six to ten hours after receipt of injury 2 were cured; 1 case operated upon from eleven to fifteen hours after the accident was cured; of 3 cases in whom operation was done from sixteen to twenty hours after receipt of injury 1 was cured; of 3 cases operated upon as late as twenty-one to sixty hours after receipt of injury not one survived. These data show plainly that the prospects of cure by operation diminish rapidly from hour to hour. According to Petry's statistics of cases operated upon between 1883 and 1896—42 in number—14, or 33.3 per cent., were cured and 28, or 66.7 per cent., died. Deducting 1 case which died of intercurrent disease and 5 in whom death was due to incomplete operation, there are 22, or about 50 per cent., of deaths directly due to operation.

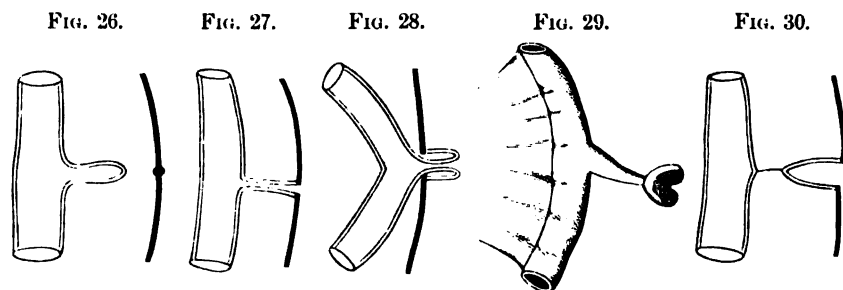
Intestinal Occlusion due to Meckel's Diverticulum. Otto Hohlbeck¹ reports three cases of intestinal occlusion due to Meckel's diverticulum. He says if we exclude the cases in which the omphalomesenteric duct has remained open, complicated by prolapse of the intestine, occlusion is most frequently attributable to the adherent diverticulum; much rarer are the cases where it is due to the free diverticulum. To the latter, above all, must be attributed the formation of diverticulum knots. Lichtenstern states that in seventy-one cases of stricture due to the diverticulum twelve were caused by the formation of knots in the free diverticulum. Other disturbances apt to be caused by the free diverticulum are inversion of the diverticulum and secondary invagination of the intestine. Hohlbeck states that recently Kramer, Piqué, Guillemot, Malgaigne, and Blunt have called attention to diseases of Meckel's diverticulum which, anatomically as well as clinically, presented the same symptoms as appendicitis. He states that if we survey the numerous dangers that beset subjects with a Meckel's diverticulum the statements of Kelynack, who considers the diverticulum a harmless formation, certainly must seem strange. Kelynack found Meckel's diverticulum eighteen times in 1446 cadavers, and in none of these was there any connection between the presence of the diverticulum and the cause of death.

The accompanying diagrams (Figs. 26 to 30) from Hohlbeck show some of the varieties of Meckel's diverticulum.

Of the three cases reported by Hohlbeck, which were operated upon

¹ Arch. f. klin. Chir., 1900, vol. lxi., No. 1.

at the Surgical Section under Von Bergmann at the City Hospital in Riga, only one was successful, the other two ending fatally. The successful case was a woman, aged thirty-nine years. The diverticulum was located 40 cm. above the valve of Bauhin. It originated at an angle of 90 degrees from the convex border of the ileum, presenting all the layers of the intestinal wall, and lay perfectly free in the abdominal cavity, without a mesentery and without any adhesions. It was 23 cm. long (the longest so far observed was 25 cm.). At the site of its beginning it was 1.5 cm. broad; further down it had a diameter of 4 cm. and then tapered toward its free end, where it culminated in a swelling the size of a hazel-nut. The incarceration in this case was caused by the formation of a diverticulum knot, according to Heiberg, and it was impossible to undo the knot in the dissected preparation before the diverticulum was split open and its contents evacuated, after which the free end could be drawn back through the loop.



According to Lichtenstern, incarceration of the diverticulum is far more frequent in men than in women. Of 66 cases 52 were men and 14 women. The average age is stated as twenty-five years, while Kelynack gives it as thirty-eight years in the 18 cases observed by him, 11 of which were men and 7 women.

The prognosis of incarceration due to Meckel's diverticulum is known to be bad. Boldt collected 55 cases, with 15 laparotomies. Of these only 3 were cured. L. Bérard and N. Delore have compiled a list of 32 laparotomies for intestinal occlusion due to Meckel's diverticulum, with 23 deaths and 9 cures.

Tuberculosis of the Cæcum. Crowder,¹ of Chicago, reports two cases of chronic hyperplastic tuberculosis of the cæcum, in one of which carcinoma of the cæcum coexisted. He has collected 84 cases of chronic tuberculosis of the cæcum, 40 being male and 44 female. The majority of the patients affected were between the ages of twenty and forty years.

The cæcum is by far the most frequent site of primary tuberculosis

¹ American Journal of the Medical Sciences, June, 1900, p. 668.

in the intestinal tract. Fenwick and Dodwell found that the cæcum was involved in 85 per cent. of all cases of tuberculosis of the intestinal tract; the cæcum alone in 9.6 per cent. Crowder states that if the tuberculosis is limited to the cæcum and not associated with any active pulmonary involvement progress is slow, and sooner or later a tumor of variable size appears. The course of the disease if left to itself is the gradual formation of adhesions with an abscess or localized peritonitis. This abscess, either primarily or secondarily, may break through the abdominal wall; this may be followed by a fecal fistula, artificial anus, or spontaneous healing. Tuberculosis of the peritoneum rarely results.

As to the comparative frequency of the simultaneous occurrence of carcinoma and tuberculosis in the cæcum, Sadow-Miclesco found among 150 cases of carcinoma 9 per cent. combined with tuberculosis. Loeb found that in 111 cases of carcinoma the disease was combined with tuberculosis in 31 cases.

In reply to the question, Do the two diseases stand in any causal relation, and if so which is primary? Crowder concludes that there exists an etiological relation between the two, tuberculosis acting not as a direct but as a predisposing cause, just as trauma or chronic irritation furnish predisposing causes for the development of malignant tumors.

This opinion I believe to be by far the most rational and in accordance with the facts observed.

Ribbert strongly insists upon tuberculosis being a direct causative agent, and reports eleven cases in different parts of the body in which he found giant cells between the advancing strands of carcinomatous tissue.

Crowder states that while very few are willing to attribute to tuberculosis the causative rôle in the causation of cancer, yet this is the most probable thing in the great majority of cases. He has no hesitation in concluding that tuberculosis of the cæcum was a primary affection and bore a direct etiological relationship to the development of a carcinoma in one of his cases.

TUBERCULOSIS OF THE LARGE INTESTINE. Hugel¹ reports three cases of ileocæcal resection for tuberculosis of the large intestine, with one death. The resections were performed at the City Hospital in Coblenz, and were from 21 to 40 cm. in length. Hugel, with Baracz and Eiselsberg, believes that resection of the intestine is indicated so long as the diseased portion of the intestine is movable and not too large, and as long as there is no tuberculous involvement of the neighboring lymphatic glands and the patient does not show lung symptoms. This

¹ Arch. f. klin. Chir., 1900, vol. lxiii., No. 4.

operation he says guarantees the thorough removal of the disease, so that recurrence need not be feared. Wherever resection is contraindicated or impossible, complete exclusion of the intestine, with total transposition of the excluded section of the intestine and temporary closure of its ends, should be done.

In comparing the results of the twenty-four cases so far operated upon in which the tuberculous tumor was left in the peritoneal cavity and the fifty-eight cases so far reported of total extirpation of the tuberculous section of intestine he found that the mortality of both methods was about the same—viz., 19 per cent. However, further investigation showed that about 25 per cent. of the patients operated upon died sooner or later of tuberculosis.

Hugel states that if the danger of generalization of the disease is so great in cases of tuberculous tumor of the intestine even total exclusion, with retention of the intestinal tumor in the abdominal cavity, cannot be considered a radical operation.

He reports a case in which death was due to an old suppurative peritonitis, traceable to the approaching perforation of an ulcer of the small intestine. Resection was done thirty-seven days after total exclusion of the intestine had been performed.

Murphy's Button. At the last International Medical Congress at Paris Murphy presented the statistics of 1620 cases in which the Murphy button had been employed. These statistics comprise affections of all sorts, both malignant and non-malignant, acute and chronic. The mortality for the total series was 19.3 per cent. In sixty-six cases in which the button was used for non-malignant troubles the mortality was but 2 per cent. Murphy believes that prior to the use of the button the mortality in such cases was 30 to 40 per cent. Although he recognizes that there are certain disadvantages in leaving a foreign body in the digestive tract, up to the present time he does not believe that any absorbable buttons have been made that fulfil the requirements.

Exclusion of the Intestine. Terrier and Gosset¹ give the results of the operation of exclusion in 52 cases that they have been able to collect from the literature. The total mortality is 15.38 per cent.

The operation was performed 25 times for fecal fistula, or artificial anus. In most of these cases the surgeon had tried to do a resection, but had failed on account of the extensive adhesions.

While exclusion alone may not always cure the fistula, it may render resection at a later period possible. Of the 25 cases for fistula there were 2 deaths from operation. Eliminating 2 other cases there remain 21 cases, of which 10 were cured by the operation. In 4 other cases

¹ Rev. de Chir., 1900, No. 11, p. 638.

secondary resection was performed; 1 case was not traced, and in the remainder the fistula persisted.

FIG. 31.

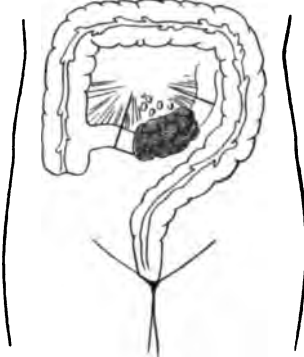
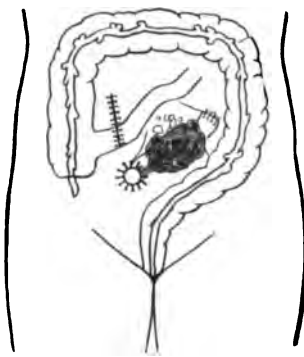


FIG. 32.



Exclusion of small intestine. (TERRIER and GOSSET.)

FIG. 33.

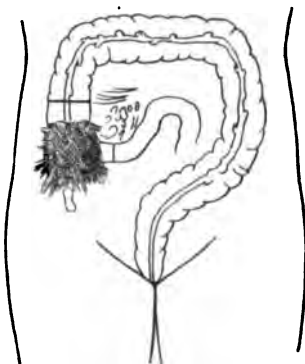


FIG. 34.



Exclusion of caecum. (TERRIER and GOSSET.)

FIG. 35.

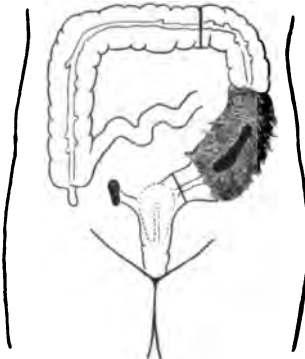
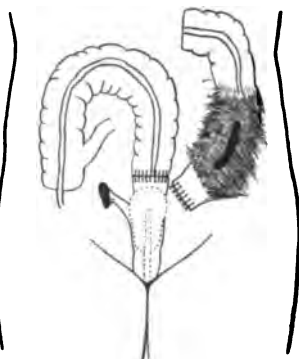


FIG. 36.



Exclusion of sigmoid. (TERRIER and GOSSET.)

Exclusion was practised 10 times for tuberculosis of the cæcum; of these 10 cases there were 10 operative deaths. The value of the operation can be fairly well determined from the remaining 7 cases.

Three recovered, with a fistula. In 3 others the cure was complete, and the remaining 1 was cured by a secondary resection, which the operation of exclusion rendered possible.

Figs. 31 to 36 show exceedingly well the various ways of performing exclusion. I believe with Bovis that, notwithstanding the poor results in fecal fistula, the operation should seldom if ever be performed for malignant disease.

Cancer of the Large Intestine. By far the most complete and scholarly paper upon cancer of the large intestine is that of Bovis, beginning in the *Revue de Chirurgie* of June, 1900, and continuing through the five succeeding numbers. The paper is based upon a most careful analysis of 426 cases treated by surgical intervention since the antiseptic era began.

The first number contains seventeen unpublished cases, three of which were personal. The author has included under the term "cancer of the large intestine" all malignant tumors: carcinoma, epithelioma, sarcoma, and malignant adenoma developing in the large intestine between the ileocæcal valve and the rectum. It is somewhat difficult to draw the line between cancer of the sigmoid flexure and the rectum, but Bovis has rejected all those cases operated upon by the anorectal route by Kraske's or similar methods. He states that cancer of the large intestine was known and treated as far back as the time of Artaxerxes and Leonidas of Alexandria.

During the last years of the eighteenth century and the first quarter of the nineteenth cancer of the intestine was considered of slight interest. Anatomists and histologists studied it, but the societies paid little heed to the communications upon the subject. In 1843, when a surgeon of Lyons reported a case in which he had resected the intestine and cured a cancer, it was frowned upon and his surgical audacity condemned.

In 1874 Despré stated that cancer of the intestine should be looked upon in the same light as cancer of the stomach; that is to say, one was as hopeless as the other. The thesis of Puroit terminated this period and there was a revival of the attempts of ancient surgery to treat this condition. The opening of the antiseptic period found Gussenbauer and Schede in 1878, Guyon and Czerny in 1880, Billroth in 1881, and Maydl in 1883 attacking cancer of the intestine by resection. Although these attempts were by no means always successful, operative procedures received more and more the sanction of surgical opinion. The first operative success was that of Gussenbauer and Martini, in 1880.

Numerous and important papers both upon the surgical and palliative treatment of cancer of the intestine quickly followed. The paper of Gallatour, of Zürich, in 1895, was the first complete work upon cancer of the large intestine.

ETIOLOGY. Bovis states that of 12,108 patients treated between 1881 and 1891 at Krönlein's Clinic at Zürich 627, or 1 in 807, were cancers, of which 15 were cancer of the intestine exclusive of the rectum. Of 76,494 deaths occurring during this period at the Zürich Clinic death from cancer of the colon or large intestine occurred 109 times, giving a proportion of 1 in 701. The figures 1 in 807 give the number of chances one has of meeting a cancer of the large intestine in general surgical patients, excluding gynecological cases.

During the years 1870 to 1881 there were found among 246,827 patients at the "Wiener Allgemeine Krankenhaus" 6287 cancers, of which 30 were of the large intestine, or a proportion of 1 in 8229. Bovis concludes that if one admits that the surgical service represents about one-third or one-fourth of the death-rate of the hospital in general, it may be inferred that you will meet one death from cancer of the large intestine in every 2000 or 3000 patients. On the other hand, from the record of the Anatomical Institut at Zürich and Helsingfors, it appears that cancer of the intestine occurs once in every 300 to 400 hospital deaths.

The relative frequency of cancer of the intestine as compared with other cancerous affections is well brought out by Bovis' table. Of 9118 cases of cancer collected by Tanchon cancer of the colon and intestine occurred 157 times; of the rectum, 221 times; of the stomach in 2303 instances, and of other organs in 6437 cases, or 1.72 per cent. of the total number were cancer of the large intestine. This percentage in the statistics of Lichtenstern is 0.76 per cent.; in that of Maydl, 0.47 per cent., based on the number of patients that entered at the "Wiener Allgemeine Krankenhaus" and upon the autopsies of the same institution. The highest percentage is that of Roupp—*i. e.*, 5.37 per cent., also based on 337 cases of autopsy.

All these statistics show that cancer of the intestine, large and small, is not much less frequent than that of the rectum, and that cancer of the small intestine is very rare.

As to the location of cancer of the intestine, Bovis estimates that 6.3 per cent. occur in the small intestine, 11.9 per cent. in the cæcum, 20.4 per cent. in the colon, 11.9 per cent. in sigmoid flexure, and 49.2 per cent. in the rectum.

As regards the sexes Hausmann found in 289 cases observed that 51.3 per cent. occurred in men and 40.7 per cent. in women. Bovis' statistics show a percentage of 53.9 for men and 46.1 for women.

The age at which cancer of the intestine occurs is of great interest. Of 400 cases collected by Bovis—

5 occurred between	.	.	.	.	.	11 to 20 years.
30	"	"	.	.	.	21 " 30 "
73	"	"	.	.	.	31 " 40 "
113	"	"	.	.	.	41 " 50 "
103	"	"	.	.	.	51 " 60 "
41	"	"	.	.	.	61 " 70 "
4	"	"	.	.	.	71 " 80 "
2	"	"	.	.	.	81 " 90 "

Hausmann collected five cases which occurred under the age of ten years, and Bovis himself found two patients of fourteen and sixteen years respectively. One case reported by Clair showed a carcinoma in a child three years and nine months old.

Bovis draws attention to the extraordinarily large proportion of early cancer of the intestine occurring in the female. Of 35 cases observed between the ages of eleven to thirty, 23 were female.

In stating the possible etiological factors very little new is brought out. In enumerating the local factors strain was observed in 4 cases, habitual constipation in 3. Bovis classifies the tumors according to the anatomical and etiological characteristics, as follows :

1. Cancer lateral, which he regards as an initial form of the disease, he considers rare ; it was noted in his collection in only 8 or 9 cases.
2. Annular cancer he divides into scirrhus and encephaloid. :
3. Cancer of the mucous membrane—bloody, ulcerating, and vegetating masses.
4. Cancer of the lumen of the intestine.

SYMPTOMATOLOGY. Bovis discusses the symptomatology of cancer of the large intestine very fully, making three divisions : (1) Type of latency, absolute or relative ; (2) occlusive type ; (3) gastro-intestinal.

Cases of absolute latency are comparatively rare, while those of relative latency are more frequent. Slight nervousness, moderate constipation, or diarrhoea are the only symptoms present until a comparatively late period of the disease.

The occlusive type includes those cases in which the first manifestation of the disease is either acute or chronic obstruction.

The gastro-intestinal type is by far the most common. Pain is a fairly constant symptom. With rare exceptions all of these tumors begin by pain, localized at some point of the abdomen. It may be the only sign noted for long periods of time. In one case reported by Roupp it was the only symptom for two years. Gastric symptoms are very frequent, and diarrhoea is fairly frequent in cancer of the large intestine. The appearance of a tumor is sometimes the first sign noted.

This is true in a limited number of cases. Bovis states that diarrhoea occurs in about one-seventh to one-eighth of the cases.

The location of the neoplasm in the large intestine is important. The disease occurs most frequently either in the cæcum or in the sigmoid flexure. Of 58 cases Bovis found it in the ileocæcal valve in 5; cæcum, 15; ascending colon, 6; hepatic flexure, 3; transverse colon, 3; splenic flexure, 2; descending colon, 1; sigmoid, 23.

Objective Symptoms. An intestinal tumor is rarely large, and, like that of the stomach, is frequently resonant (filled with gas). It is seldom visible to the eye; the abdomen is frequently distended because there is almost always a certain amount of fecal retention. Occasionally one is able to make out peristalsis and localized tympanites.

These local signs we believe to be of very great importance, and they have been well marked in the few cases observed by the writer. Palpation, while of major importance in intestinal neoplasms, is not always helpful. The surface is almost always irregular, and in the great majority of instances one can simply recognize the presence of the tumor without being able to tell very much about its character.

The mobility is a point of very great importance. Bovis estimates that in 106 cases 15 were very movable, 43 movable, and 48 either fixed or slightly movable.

The general condition is profoundly affected in cancer of the intestine. Oftentimes these patients eat very little on account of the pain caused by intestinal digestion. The result is that we have cachexia out of proportion to the malignancy of the disease. This is shown by very great loss of weight, sometimes amounting to forty to fifty pounds.

GENERAL COURSE OF THE DISEASE. Acute intestinal obstruction—that is to say, complete suppression of fecal matter and gas—is a relatively rare phenomenon. It was observed only sixty times in 400 cases collected by Bovis. Occlusion is yet somewhat slower in coming to a crisis, and vomiting rarely becomes fecal except in very late stages. Bovis found occlusion in 60 cases and obstruction in 52, or a total of 112 in 400 cases. In the cases of sarcoma hemorrhage was not quite so frequently noticed as in carcinoma, and the development of the disease was slightly more rapid than in epithelioma.

The prognosis in sarcoma is exceedingly bad, and its return after operation has been very rapid.

THE SURGICAL TREATMENT Bovis classifies as symptomatic, palliative, and radical.

In 101 cases of enterostomy the mortality was 38.6 per cent. The mortality was the highest in cases of tumors of the transverse colon. Of 15 cases 9 died, a mortality of 60 per cent. The prognosis is slightly more grave in the male than in the female. Of 49 cases of men 44.8

per cent. died ; of 52 cases of women 32.6 per cent. died. The mortality has been steadily falling during recent years. In 17 cases operated upon prior to 1889 the mortality was 52.9 per cent. In 84 cases operated upon since 1889 the mortality was 35.6 per cent.

As to the duration of life after enterostomy, it was 10.1 months on an average in 17 patients traced. The average duration of the disease prior to operation was 11.5 months, giving a total duration of life of 21.6 months from the time of the inception of the disease to death.

Entero-anastomosis, including Exclusion of the Intestine. Of 44 cases of entero-anastomosis and exclusion there were 12 operative deaths, or a mortality of 27.5 per cent. Bovis gives a table of cases of cancer of the intestine treated by exclusion, a method of operation which he regards with little favor. He believes that it is dangerous and offers no advantages over other palliative measures in cancer of the intestine.

In regard to entero-anastomosis, properly speaking, this was performed three times by Senn's plates ; the Murphy button was used 14 times and the method of suture without artificial aids in 23 cases. Of the 14 cases in which the Murphy button was used 4 died, 3 deaths being attributable to the button.

Bovis believes that the use of the button in these cases of cancer of the large intestine favors the accumulation of fecal matter and the formation of scybalous masses. In two of the fatal cases there was obstruction in one after six days and intestinal occlusion in the second. He states that a certain number of observations seem to indicate that the Murphy button in the large intestine easily causes obstruction when employed in patients with acute or chronic obstruction.

Anastomosis by the method of suture was employed in 23 cases, with 2 deaths from peritonitis. He believes that the sutures have rendered such good service in entero-anastomosis, and their execution is so much easier than end-to-end anastomosis, that, in view of the accidents that have followed the employment of the Murphy button, the method of suture is preferable in entero-anastomosis for malignant disease, especially in the presence of occlusion.

As to the final results in these cases, the average duration of life in the 13 cases traced was 6.4 months after operation ; the duration of the disease prior to operation was 14.8 months, giving a total average duration of the disease of 21.2 months.

A study of the cases of enterectomy is by far the most interesting and valuable portion of Bovis' monograph : 171 cases were treated by resection, with 54 deaths, or a mortality of 31.5 per cent. Bovis, rightly we believe, considers this mortality a good deal lower than the actual mortality, which can be fairly well estimated by a study of the statistics of individual operators and those of single clinics. In 104 such

resections the mortality was 38.4 per cent. Prior to 1889 the mortality from enterectomy for cancer was 58.8 per cent. In 20 of the 171 cases operations were performed in the presence of conditions of grave obstruction or acute occlusion. The mortality of these 20 cases was 50 per cent. Of the 41 remaining deaths there were only 7 that could be attributed to the sutures or the Murphy button.

As to the technique of operative procedures, the method of simple sutures was used in 140 cases, with 27 deaths, or a mortality of 19.3 per cent. The Murphy button was employed in 21 cases, with 5 deaths, or a mortality of 23.8 per cent. Bovis states that 7.8 per cent. of the mortality was directly attributable to the sutures and 14.2 per cent. to the Murphy button. This difference, however, may mean little or nothing, inasmuch as Bovis very fairly states that there has been a certain tendency of reserving the use of the button for the worst cases. The question of drainage in these cases is very important. In 152 cases in which the question of drainage was considered it was employed in 46 cases, with 28.2 per cent. mortality; fixation of the loop of bowel to the abdominal wall, 2 cases, with no deaths; tamponade, 11 cases, with 45.2 per cent. mortality. Drainage was not indicated or not used in 93 cases, with 34.4 per cent. mortality. This shows a considerably smaller proportion of deaths in the cases in which drainage was used. Of 93 cases in which drainage was not used purulent or fecal fistula followed in 13 cases. On the other hand, after drainage fecal fistula is even more common. Out of 32 cases with drainage, in which the patients recovered, fecal fistula was observed in 18.

The final results after radical operation cannot as yet be called brilliant: 42 patients survived from three months to ten and a half years; only 10 of these passed the three-year limit; 1 case was well six years after operation; 1 eight years; 1 ten and a half years. Bovis states that if we regard all the patients as dying immediately after the last report of their condition we would have in these 42 patients who survived operation an average duration of life of 23.2 months. Including the time the disease existed prior to enterectomy the total average duration of disease in these cases was thirty-three months.

Coming to the more complicated cases, there are 38 cases in which enterectomy was performed after the establishment of an artificial anus, with a mortality of 36.8 per cent. This, again, Bovis believes to be too small, the actual mortality being more nearly 53.8 per cent. Of this number 10 patients lived from three to forty months after operation; only 1 of these, however, survived more than three years. As regards the still more complicated cases—the class of patients in whom several preliminary operations had to be done—there were 36 cases, with 6 deaths, a mortality of 16.6 per cent., which is remarkably small. In

38 cases of complicated enterectomy there was a mortality of 46.4 per cent. This class includes double and triple resection. In 7 of these cases the tumor was in the cæcal region, with 4 deaths; in 5 in the ascending colon, with 3 deaths; 9 in the transverse colon, with 4 deaths; 2 in the descending colon, without deaths; 4 in the sigmoid flexure, with 1 death.

As regards final results, 3 patients were known to be alive more than one year; only one of these more than three years. The total average duration of the disease was 32.5 months.

ON THE OPERATIVE TREATMENT OF MALIGNANT DISEASE OF THE LARGE INTESTINE. Körte¹ has also recently published a very valuable article on this subject. He mentions the successful operation for carcinoma of the large intestine done by Reybard as far back as 1833. The patient remained well for six months, but died of recurrence ten and a half months later. It was Gussenbauer, in conjunction with Martini, who achieved the first grand result. The patient operated upon by them in 1878 survived the operation eighteen years, without metastases, and died of heart failure. Maydl, in 1883, published 18 cases collected by him (including one of his own). Of 17 circular resections 7 were successful. At the Heidelberg clinic, up to 1896, there were 18 resections for malignant disease of the large intestine, 8 of the cæcum, 4 of the transverse colon, 2 of the descending colon, and 3 of the sigmoid flexure. The mortality was 50 per cent. Some of these cases were very serious, 3 of them being double resections. As to the duration of cures in these cases, 1 was alive and well ten and a half years after operation, 1 five and a half years, and 1 three and a quarter years; 1 died of recurrence three and a quarter years after operation.

König, up to 1890, had 7 cases of radical operation for malignant tumors of the intestine, with 3 recoveries and 4 deaths; 3 times a false anus was established, with 1 death; 3 times an exploratory laparotomy was done without further operation.

At the Halle clinic 14 cases were operated upon for malignant disease of the large intestine between 1890 and 1898; 6 of these died and eight recovered; 7 of the latter were alive and well from one to six years after operation.

Körte calls attention to the greater frequency of malignant disease of the large intestine over the small. He observed 54 patients with malignant tumors of the large intestine, 3 of the small intestine, and 1 in the duodenum, which proportion is similar to that found by Maydl, Nothnagel, Bloch, and others. According to Körte's observations, men are more liable to the disease than women.

¹ Verhandlungen der Deutsch. Ges. f. Chir., 1900, p. 61.

As regards the age of the patients, there were but 2 between twenty and thirty years, 48 between thirty-one and seventy years, with about an equal number in each of the four decades ; 3 were between seventy-one and eighty years ; 1, the oldest, eighty-four years.

Two of the patients claimed a trauma as the cause of the tumor, but Körte does not consider himself warranted in accepting this view.

With reference to locality, the tumor was found in the

Sigmoid flexure	19 times.
Ileocæcal region	15 "
Transverse colon	8 "
Splenic flexure	6 "
Ascending colon and hepatic flexure	3 "
Transverse colon, descending colon, and splenic flexure and sigmoid	1 each.

In 43 of the 54 cases observed by Körte operative treatment was employed ; in 6 the tumor was situated in the ileocæcal region ; 5 times it was a carcinoma ; once a sarcoma. All of these patients recovered. One patient, in whom a very extensive operation was done, is alive and well eight and a half years after operation ; another, six years ; a third, five and a quarter years. One died of tuberculosis of the lung two and a half months after operation. Two died of recurrence one and a half years and eight months respectively after operation. Körte states that operative results are best in the ileocæcal region. In addition to the preceding six cases of malignant tumor he has done resection of the ileocæcal portion of the intestine in eleven cases of tuberculous tumor, and once for actinomycosis, with no deaths. This favorable result, he says, is partially due to the absence in all of the cases of intestinal obstruction. Intestinal union was generally accomplished by end-to-side implantation of the ileum into the colon by means of silk sutures.

Less favorable were the results of operation for tumors in that part of the transverse colon which starts with the hepatic flexure and ends at the splenic flexure. In 6 of these cases resection was done, with the result that 4 died and 2 recovered. One of the latter is alive and free from recurrence five and three-quarter years, the other ten months after operation.

There have been no resections performed for tumors of the splenic flexure.

In the descending colon (1 case) and the sigmoid flexure (6 cases) 7 resections were done, with 3 deaths and 4 recoveries. One of the latter has remained well for nearly three years.

In all, Körte performed resection of the large intestine for malignant tumor 19 times, with 12 recoveries and 7 deaths, or a mortality of 36.8 per cent. Of the 12 successful cases 5 were well from three to eight and a half years.

Opium is never given after treatment ; morphine only during the first nights, if necessary. All operations were performed under general narcosis. Subcutaneous or rectal saline infusions were often used as stimulants after operation and also in order to quench the thirst of the patients. The Murphy button was never used ; its disadvantages in operations upon the large intestine are manifold—its introduction into the irregularly shaped large intestine seems less reliable than in the small intestine ; beside, it easily becomes obstructed. A double row of continuous silk sutures, with round needle, was employed ; whenever the intestine was sufficiently elastic straight English sewing-needles with oval eyes were used.

Seven times end-to-end union of the intestine was performed (5 recoveries and 2 deaths). Nine times end-to-side implantation of the central into the peripheral end (6 recovered and 3 died). Three times side-to-side (1 recovered and 2 died).

In 3 patients resection was preceded by enterostomy on account of intestinal occlusion ; 2 of these died.

His general advice in the presence of intestinal occlusion is to do resection at the same time only in such cases where the constricting tumor can be readily found and pulled forward so that one can operate extraperitoneally under ample gauze tamponade, and provided the condition of the patient is such as to permit this more lengthy operation.

As to palliative operations, 12 entero-anastomoses were done, with 9 recoveries and 3 deaths. The longest duration of cure was three years, in 1 case. In 20 of his cases he was forced to perform colostomy, serious symptoms of occlusion being present in most of them ; 6 of these died as a result of the operation, while 14 survived it for some time—that is, up to three and a third years in 1 case and in five others operations had to be added later.

Ileostomy immediately above Bauhin's valve was performed in 2 cases, with 1 death ; cæcostomy in 8, with 2 deaths ; transverse colostomy in 1 ; sigmoid colostomy in 9, with 3 deaths.

Körte well concludes that while the results of operative treatment of malignant tumors of the large intestine are encouraging they certainly may be improved, but he believes that improvement must be looked for less in the direction of improved technique than in that of earlier diagnosis and earlier operation.

As regards my own experience, I have observed 5 cases of malignant tumor of the large intestine :

1. Cancer of ascending colon	70 years.
2. " " " "	66 "
3. transverse colon	38 "
4. Sarcoma of cæcum	25 "
5. Cancer of cæcum	41 "

The last case was one of double resection of the cæcum and seven inches of the small intestine, in performing which I used two Murphy buttons. The patient is in good health twenty-one months after operation, though there is local evidence of return of the cancer.

RESECTION OF THE LARGE INTESTINE FOR CARCINOMA. Zimmermann¹ publishes a valuable paper on the "Operation and Results of Resection of the Large Intestine for Carcinoma." Of 36 patients observed at the Zürich (Krönlein) clinic between 1881 and 1900, 12 were treated by radical operation. In these the seat of the disease was—

Cæcum and ascending colon	. . . . .	in 6 cases.
Sigmoid flexure	. . . . .	" 5 "
Descending colon	. . . . .	" 1 case.

The ages of the patients ranged between thirty and seventy years, the average age at the time of operation being fifty-five years. Heredity could be established in but 2 instances; 11 of the patients were male and 1 female.

As regards the type of the growth, 1 was a lymphosarcoma, with metastases in the liver; 1 a gelatinous carcinoma; 1 adenoma, with carcinomatous degeneration; 1 cylindrocellular cancer; 1 an adenocarcinoma of scirrhus character.

In 4 others the type of carcinoma was not noted.

Six of these patients having malignant tumors of the intestine were cured and 6 died, thus giving a mortality of 50 per cent.

In 6 cases resection of the cæcum was performed, with 3 deaths; in 5, resection of the sigmoid flexure, 3 of which operations resulted fatally. The causes of death were fibrinous peritonitis in 4 instances, collapse in 1, and senile marasmus in 1.

Of the 6 patients dismissed as cured 5 are alive to-day and in perfect health and strength; the sixth patient, a man aged seventy years, died of senile marasmus a few weeks after leaving the hospital.

There have been no recurrences. The duration of the cures is as follows:

1 case	. . . . .	14 years.
1 "	. . . . .	2½ "
1 "	. . . . .	1½ "
1 "	. . . . .	5½ months.
1 "	. . . . .	5 "
1 "	. . . . .	Not stated.

In a series of 61 cases operated upon by Krönlein, Körte, Czerny, Billroth-Salzer, and König the location of the tumors was as follows:

¹ Beitr. z. klin. Chir., 1900, vol. xxviii., No. 2.

In the cæcum	in 30 cases.
Ascending colon	" 1 case.
Transverse colon	" 11 cases.
Descending colon	" 12 "
S. Romanum	" 7 "

The mortality of the foregoing operators is :

Krönlein	12 cases, with 6 deaths,	50	per cent.
Körte	19 " " 7 "	36.84	"
Czerny	10 " " 5 "	50	"
Billroth-Salzer	10 " " 6 "	60	"
König	7 " " 4 "	57.1	"

Thus the total mortality after resection of the large intestine (excluding the rectum) by the above surgeons for malignant tumors is 48.4 per cent.

Malignant Disease of the Small Intestine. Libman¹ states that during the past two years five cases of intestinal sarcoma have been observed at the Mt. Sinai Hospital; four of these came to autopsy. Three of the cases bore a very close resemblance to cases of appendicitis.

The first was a boy, aged twelve years, with a history of pain in the abdomen in the region of the umbilicus, and marked constipation, the symptoms having existed for only nine days. The patient died of empyema and purulent peritonitis four weeks after the operation. Autopsy showed a large growth of the duodenum, including the gut and projecting into the lumen; the mucosa was intact. Microscopically the growth was a lymphosarcoma. Intestinal metastases were found. It is noteworthy that the patient had been sent to the hospital with a diagnosis of appendicitis. The primary tumor was not discovered until autopsy.

The second patient was a child, aged three and a half years, with a history of eight days' duration. There was an irregularly shaped mass in the right side of the abdomen extending as far down as the umbilicus. Some hard, round masses were felt just above the groin; considerable abdominal distention was present.

Operation was performed on June 5th and the child died on the following day. All the intra-abdominal lymph glands were found enlarged, and on dissection they were white, succulent, and soft. At the beginning of the ileum there was a large white tumor, infiltrating the wall near the mesentery. The mucous membrane of the intestine, except in a small area, was intact. The ileum was considerably dilated at the site of the tumor. Infiltration of the wall of many other of the intestinal coils, with marked adhesions, was observed. The liver was much enlarged and was uniformly infiltrated with new-growths. Microscopical examination showed the tumor to be lymphosarcoma.

¹ American Journal of the Medical Sciences, September, 1900.

Although this case is regarded by Libman as a primary intestinal sarcoma, a careful study of the findings at the autopsy would lead one to believe that the origin of the growth was probably in the mesenteric glands.

The third patient was a male, aged eighteen years, with symptoms of only one day's duration, beginning with abdominal pain, more marked on the right side below the umbilicus. There was no history of previous similar attacks. The patient entered the hospital with very rapid and shallow breathing, imperceptible pulse, and tympanitic abdomen; a doughy mass could be felt by rectum, high up. On opening the abdomen a large amount of fluid fecal matter and serum poured out; the appendix was found normal. The patient died shortly after operation. At the autopsy a perforation of the jejunum, about four feet from the duodenum, was found. The perforation was caused by a tumor which had infiltrated the intestine and dilated it. The tumor almost completely surrounded the intestine. No metastases were observed in this case. The microscopic examination showed the growth to be a lymphosarcoma. This case is worthy of special note from the fact that not a single symptom of the disease existed prior to the perforation.

The fourth patient was a man, aged forty years, who had had irregular abdominal pains for two weeks. Four days prior to admission to the hospital there had been severe abdominal pain, most marked in the pelvis, but no fever, chills, or vomiting. The patient was emaciated and an irregular tumor could be felt in the hypogastric region. On opening the abdomen a very large hemorrhagic tumor was found, springing from the ileum, adherent to the right iliac wall, the floor of the pelvis, large vessels, and the bladder. After considerable difficulty the tumor, together with two inches of the small intestine, was removed and Murphy button anastomosis performed. The patient died of peritonitis three days after operation. The tumor was irregular in shape, 15 x 13 x 8 cm. It was found to begin in the submucosa, reaching to the mucosa, but not involving it. Microscopical examination showed it to be spindle-celled sarcoma. No metastases were found.

Libman states that from 1859 to 1875 there was no case of intestinal sarcoma observed at the Berlin Pathological Institute. Thirteen cases were recorded at Prague, in fifteen years, in 13,036 autopsies; while Nothnagel, of Vienna, in twelve years, found at autopsies 12 cases of intestinal sarcoma.

The occurrence of 4 cases within the short period of two years in a single hospital in New York leads Libman to observe that we may have to deal with an endemic disease, as there is reason to suspect these tumors to be of infectious origin. Compared with the total number of

sarcomata the intestinal cases are not so infrequent. Nothnagel found that in 274 cases of sarcoma there were 3 of the intestine, and of 61 lymphosarcomata 9 were primary in the intestine.

Personally I have observed 316 cases of sarcoma, and of these only 2 were primary in the intestine; a third one started in the mesenteric glands but involved the intestine; it was probably primary in the mesentery. Carcinoma occurs more frequently in the intestines than sarcoma. Nothnagel's statistics show among 2125 carcinomata 243, or upward of 10 per cent., occurring in the intestine. Libman states that sarcoma is more frequent in the small intestine than in the large.

As regards the age, he has collected 51 cases, which show that it has occurred—

In the first decade	.	.	.	.	.	.	9 times.
" second decade	.	.	.	.	.	.	9 "
" third "	.	.	.	.	.	.	13 "
" fourth "	.	.	.	.	.	.	13 "
" fifth "	.	.	.	.	.	.	8 "
" sixth "	.	.	.	.	.	.	1 time.
" seventh "	.	.	.	.	.	.	1 "

As to causation nothing practically is known, although we have cases on record where the influence of trauma as an etiological factor is apparent. Libman states that in several instances the disease developed after a trauma, the usual interval between the injury and the development of the symptoms being five to six weeks. Flexner, in reporting two cases, calls attention to the histological feature of the growth which, he believes, might throw some hint as to the causation of lymphosarcoma. He found in the growths in the stomach, intestine, and kidneys certain peculiar bodies which he believed to be protozoa, although he stated they might have no causal relationship. Libman found similar bodies in the sections from the involved organs in the cases of intestinal sarcoma observed at the Mt. Sinai Hospital, and he agrees with Flexner that they are at least suspicious.

As regards metastases, of 5 cases of spindle-celled sarcoma 4 had no metastases. Of the lymphosarcoma, 17 in number, 3 involved the duodenum, 4 the jejunum, 3 the ileum, 1 the appendix, 1 the ileum and jejunum, and 1 the whole intestinal canal. In 3 cases only were there no metastases. The liver and kidney are the favorite seat of metastatic growths.

While the symptomatology of the disease is so extremely varied, Libman believes that in a certain number of instances the diagnosis can at least be strongly suspected. If there is a large, movable tumor present, or one large and several small tumors, or a movable growth can be felt per rectum, with little or no ascites and early œdema of the legs, he believes that the diagnosis of sarcoma of the omentum or mesentery

is very probable, especially if occurring in a person under fifteen years of age. The diagnosis of peritoneal sarcoma having been made and the tumor being movable, he thinks that the existence of a primary intestinal sarcoma must be strongly suspected.

The duration of the disease is variable, having been from two weeks to one and three-quarter years. The prognosis is invariably fatal. Libman states that in only one instance recorded was a patient alive after one year, and in this case the outlook was bad.

In this connection it may be of interest to state that a patient operated upon by Dr. Willy Meyer for sarcoma of the mesentery involving the small intestine, with the diagnosis of round-celled sarcoma, confirmed by Dr. Schwytzer, pathologist at the German Hospital, which I afterward treated for several months with the mixed toxins of erysipelas and bacillus prodigiosus, was still alive and in good health when last observed, four years after treatment.

Malignant Disease of the Rectum. RESECTION OF THE RECTUM BY THE VAGINAL ROUTE has again been recently advocated by Dr. John P. Murphy,¹ of Chicago. Murphy states, with truth, that the profession has not agreed upon what is the best method of resecting the rectum for carcinoma. He believes that while the posterior operations, including those in which access to the rectum is obtained by the sacrifice of the whole or portion of the sacrum, attract most attention and have found many advocates, they are both difficult and dangerous and in many other respects ultimately unsatisfactory. The mortality, according to the most recent statistics of Prutz, based upon the results of fourteen of the largest European clinics, is 21.2 per cent.

Murphy briefly outlines the development of the vaginal operation from the first operation performed by Des Quins in July, 1890, up to the present time. Des Quins removed the rectovaginal septum with the tumor, drew down the sigmoid, and sutured it to the anal portion of the rectum. The peritoneum was not closed by suture. The patient died shortly after the operation.

In 1891 L. L. McArthur, of Chicago, in operating for a recurrent carcinoma of the rectum, removed the diseased portion of the bowel and sutured the proximal end into the upper part of the vagina. The result was satisfactory.

In 1895 and 1896 similar operations were performed by Rehn and Vantrín abroad, by Joseph Price, of Philadelphia, and by Byford, of Bristol.

In 1889 Sternberg reported 14 cases operated upon by the vaginal route at Gersuny's clinic. There were 12 recoveries and 2 deaths.

¹ Philadelphia Medical Journal, February 23, 1901, p. 383.

Murphy states that vaginal proctectomy has been advancing in the direction of the peritoneum and sigmoid without any definite plan as to a vaginal *coeliotomy*. In describing the operation as performed by himself he states that the vagina is dilated with broad specula, the cervix drawn down, and the cul-de-sac opened by a transverse incision similar to that used in vaginal hysterectomy. Large laparotomy sponges are passed into the peritoneal cavity to keep the intestines out of the field of operation. The rectovaginal septum is next divided down to the rectum by a vertical incision in the median line extending from the post-cervical opening and including the sphincter ani. The posterior vaginal wall is then dissected laterally from its attachments to the rectum. This permits the sigmoid to be handled throughout its entire extent and to be brought down without any difficulty. The anterior rectal wall was next divided by scissors to the lower portion of the tumor "and the anal segment of the rectum separated from that just above it by a complete transverse incision one inch below the lower limit of the tumor, the incision extending into the post-rectal connective tissue." The portion of the rectum containing the tumor is then freed and the rectum amputated well above the upper border of the growth. The sigmoid is then brought down and sutured to the sphincteric segment by silk sutures. The sutures are so placed that they pass from within outward, leaving all the knots to be tied on the inside of the bowel; the ends are left long, to facilitate removal. The vaginal wall is then sutured to the cervix and the edges of the vertical cut united in the median line with silkworm-gut sutures. A large rubber drainage-tube, one inch in diameter, is inserted into the rectum and sutured in place.

His report of the following cases is of interest:

CASE I.—Woman, aged sixty-seven years. Operation similar to that in the foregoing case was done May 30, 1899. The time consumed was one hour and fifteen minutes. As there was some fecal discharge into the vagina, which continued, it was decided on the twenty-ninth day after operation to close the rectovaginal fistula by operation. Convalescence after the second operation was uneventful. The patient was discharged from the hospital, with all her wounds healed, on July 17th, not quite seven weeks after operation. The last report states that she is perfectly healthy; there is no evidence of recurrence, she has full control of the bowels, and the rectovaginal fistula has remained closed.

CASE II.—Woman, aged forty years, was operated upon January 26, 1899. Examination had shown an ulcerated area, with raised, slightly indurated borders situated on the posterior rectal wall, about two inches above the sphincter ani. The sphincter was dilated and the

ulcer brought down and excised. Silkworm-gut was used in uniting the edges of the defect. The patient was discharged February 18, 1899.

CASE III.—Patient was thirty-one years of age. Operation November 10, 1900. Sphincter ani was retained, and there was firm contraction at completion of operation. January 11, 1901, partial failure of the perineal union.

CASE IV.—Operation December 14, 1900. Annular stricture. Patient twenty-six years of age. Resection of two and a half inches for non-malignant stricture. Peritoneum closed; post-rectal drainage. January 17, 1901, the patient had complete control of the sphincter. Rectovaginal septum and perineal body had united without fistula. The rectal tube inserted at the time of operation was removed at the end of eighteen days and the sutures a little later.

Conclusions. The advantages offered by the vaginal route are :

1. The sacrum and posterior bony wall of the pelvis are not disturbed.
2. The field of operation is as extensive and the anatomical parts as accessible as in the trans-sacral operations.
3. The peritoneal cavity is opened in both the vaginal and sacral operations, and in neither is it a source of great danger.
4. The diseased tissue is more accessible for inspection and the extent to which the operation may be carried in an upward direction is as great, if not greater, than by the sacral route.
5. The peritoneum may be drained freely through the vagina.
6. A perfect end-to-end approximation, either by suture or by the use of the button, may be secured. The preferable method of uniting the two ends is by interrupted sutures of silk because, as there is no peritoneum on the sphincteric segment, failure of union with the button is to be feared.
7. The sphincter is retained and the perineal body is restored. There is diminished action of the levator ani muscles.
8. When the operation is complete the parts are practically in their normal positions.

He has performed the same operation on the male cadaver and finds that by splitting the sphincter directly through the median line, anteriorly and posteriorly, cutting back to the coccyx and opening the rectovesical fold of the peritoneum, practically the same field for operation can be obtained as in the female. Several inches of the bowel can be excised and end-to-end union secured. Either anteproctéal or post-proctéal drainage may be used. The cut ends of the sphincter are united anteriorly and posteriorly. The lateral nerve-supply on either side is not disturbed.

STATISTICS AND OPERATIVE TREATMENT OF CARCINOMA OF THE RECTUM. Joseph Pichler,¹ in his article, refers to a statement regarding the results after resection and amputation of the rectum by the sacral method which appears in König's *Text-book of Surgery*, seventh edition, vol. ii., recently published, according to which Hochenegg is cited with 20 per cent., Kraske with 3.9 per cent., as regards the relative danger of the operation. This Pichler declares to be not in conformity with the facts and disproves it by the following statistics :

In 563 cases of carcinoma of the rectum collected by him in which operation was performed by the sacral method, there were 81 deaths, or 14.3 per cent. Out of these Hochenegg operated 119 times, with 6 deaths, or 5.04 per cent. Including the 4 cases he does not count here—bronchitis, hemorrhage of stomach, embolism of brain, and internal incarceration—10 patients died in consequence of the operation; 14 could not be traced; 40 succumbed to recurrences—in no instance a local recurrence. Of these 40 patients :

7 died within	1 year.
12 after	1 "
16 "	2 years.
3 "	3 "
1 "	5 "
1 "	8 "

The average duration of life after operation was about 21.4 months. Thirty-two patients are living to-day :

5 after operation over	3 years.
2 " " "	4 "
3 " " "	5 "
3 " " "	6 "
1 " " "	11 "
1 " " "	12 "

The remaining 17 were operated upon less than three years ago.

Deducting from the series of 119 cases those in which the patient died in consequence of the operation, those in which the patient could not be traced, and those in which the operation was performed less than three years ago, there remain 67 cases that come into consideration as permanent cures. Of these 29, or 43.3 per cent., are still living or have lived longer than three years after operation. Of course, it is a well-known fact that recurrences may set in later than three years after operation.

Operation for Movable Carcinoma of the Rectum. M. Rheinwald,² assistant surgeon to the Sisters of Charity Home, Stuttgart, describes a new method of operation for movable carcinoma of the rectum

¹ Arch. f. klin. Chir., 1900, vol. lxi., No. 2.

² Beit. z. klin. Chir., 1899, vol. xxv., No. 3.

which he thinks should take precedence of the more extensive and bloody operations in vogue—that is, in certain suitable cases. The permanent results are fully equal to those obtained by the other methods, while the immediate results are far superior and the dangers of the procedure far less. He gives a report of three patients thus far operated upon by the method. All survived the operation and are in the best of health to-day, four years and four months, two years and six months, and two months respectively after the operation. All have gained considerably in weight. There is absolute continence in all cases despite the fact that injury to the sphincter ani was necessary.

The method consists in pulling out the movable carcinoma in front of the anus—thus forming an artificial prolapse—inserting an intestinal tube into the invagination, and ligation of the healthy tissue above the tube in the direction toward the anus.

Progress in the Technique of Operations upon the Rectum. L. Rehn,¹ in his paper, states his views as follows:

1. In exposing the peritoneal cavity injury to the sacrum should be avoided as far as possible.
2. Cancer of the rectum, even if located high up—which formerly was thought to be removable only by the sacral method—may well be removed by way of the perineum or the vagina.
3. The rectum should be dissected out extrafascially.
4. Cancer of the anus and the slightest cancerous development above the same require high amputation.
5. The sphincter should be retained whenever possible.
6. It is from the abdomino-perineal or vaginal operation that we may expect further progress in the treatment of cancer of the rectum.

SURGERY OF THE STOMACH.

Cancer of the Stomach. Cancer of the stomach has been so thoroughly studied for so many years that it seems most unlikely that any brilliant discovery will clear up the obscurity which surrounds its causation and diagnosis and point the way to the most rational treatment. Our knowledge of the subject is added to little by little as one observer after another reports a series of cases, yet there are men in a position to know the difficulties which beset the investigator in this field who still hope for important findings. Osler says: "The position of the cancer problem to-day is very much like that of tuberculosis in 1880. Who can say what a year may bring forth? And we must not despair even in this, at present, the most hopeless of all diseases."

¹ Arch. f. klin. Chir., 1900, vol. lxi., No. 4.

From the view-point of the surgeon recent statistics are more valuable than ancient ones, not only because they show the effects of recent methods of diagnosis and treatment, but because writers understand much better now than they once did how to give definitely the essential points in connection with each case so that tabulations of series of cases can be made fairly complete. In view of these facts a review of the literature upon cancer of the stomach is worth careful reading.

Osler and McCrae have written a book upon cancer of the stomach, resting their conclusions chiefly upon a study of the reports of cases in the Johns Hopkins Hospital. Many of their remarks are of interest to surgeons, since they aid in the early diagnosis of the disease. In a chapter devoted to the occurrence of cancer of the stomach in individuals below thirty years of age they indorse Mathieu's view that "the disease runs an especially rapid course in young persons, having a mean duration of three months." The writers report four cases with a life-history of less than six months, while only one patient lived eighteen months after the diagnosis was made.

Mayo Robson, who has had as great experience with cancer of the stomach as any English surgeon perhaps, finds that cancer is more common in men than in women in the proportion of two to one; that it may occur at any period of adult life, but is most commonly found between fifty and sixty years of age. Sarcoma, tuberculosis, papilloma, and other benign tumors rarely occur in the stomach, and will not, therefore, often lead to a mistaken diagnosis. On the other hand, the deposit of lymph around a pyloric ulcer may become changed into fibrous tissue, causing great thickening of the pylorus and matting of the omentum around it, so that the condition closely simulates cancer and a correct diagnosis may perhaps be impossible until microscopical sections have been made. A long-continued history of ulcer might point to the correct diagnosis, and it must be borne in mind that a chronic ulcer may end in cancer. When the symptoms and signs of ulcer of the stomach with or without stricture, but with tumor, are found at or after middle age the probability is that the patient is suffering from cancer. Cancer of the cardiac extremity can seldom be felt until it has attained a considerable size, and cancer of the pylorus often cannot be distinctly felt until it has formed a fairly large tumor, though in most cases an indefinite sense of fulness and hardness leads to a suspicion of growth before it can be distinctly defined. The tumor usually moves up and down with respiration, and when the pylorus is free from adhesions it may be felt quite easily, well away from the costal margin.

Osler and McCrae find that the stomach may be dilated to a considerable degree and still preserve something of its normal outline, or it may

assume an hour-glass or other irregular shape, or its shape may change from time to time as waves of peristalsis pass over it. It has sometimes been asserted that dilatation of the stomach due to cancer is rare, but they have seen more cases of dilatation as a result of malignant disease than from any other single cause. In this they are in accord with Robson, who says that while in cancer of the cardiac orifice the stomach is usually contracted and small, in pyloric cancer it becomes dilated and the dilatation may be the prominent sign. Inflation will not only render it possible to estimate the size of the organ, but to ascertain the relation of the tumor to the stomach cavity. In cancer of the head of the pancreas, jaundice and a distended gall-bladder are usually present and inflation will show the relation of the stomach to the tumor.

Osler and McCrae say that the tumor caused by the cancer itself, if situated at the pylorus, may be a large one owing to the invasion of the adjacent stomach walls and the hypertrophy due to stenosis. On the other hand, the tumor which at autopsy seems to be of considerable size may have escaped detection during life. This may, indeed, be possible even when a correct diagnosis has been made and the tumor repeatedly searched for. Errors in diagnosis based on the presence of a tumor are most common when there is induration about a gastric ulcer, although a simple hypertrophic stenosis of the pylorus may be mistaken for carcinoma. The history of the case and frequent test-meals are the surest means of avoiding error. Repeated examinations at short intervals will show a steadily increasing disturbance of the motility if cancer is present. Tumors of the stomach wall which do not involve the cardiac and pyloric regions compose about 20 per cent. of the total number.

If the cancer is situated in the cardiac extremity the whole stomach itself may so contract and shrink as to be felt as a narrow, firm cord beneath the left costal margin in the epigastrium. This condition is not so very rare, although little attention has been called to it. A fairly characteristic group of symptoms may be made up from the reports of individual cases. There will be the history of a gradually increasing loss of capacity for more than a certain amount of food taken at one time and vomiting at once if larger amounts are taken. On examining the abdomen there may be an evident tumor under the left costal margin or one which can be felt only on the deepest inspiration. The most important evidence, however, is obtained by the passage of the stomach-tube. This is arrested near the cardia, and at first an oesophageal obstruction may be suggested. The faint rush of air through the tube, which usually occurs when it enters the stomach—although careful attention and absolute quietness on the part of the patient are necessary to perceive it—and the immediate examination of the few drops of fluid on the end of the tube are positive evidence of the tube having

entered the stomach. No doubt remains if more fluid be obtained. The utmost gentleness is required, as the tube often gives great distress to these patients. Stomach contents, if obtained, are usually small in amount. Repeated amounts of less than 15 c.c. along with the other symptoms are very suggestive. The length of tube passed should always be compared with the distance from the incisor teeth to the fourth dorsal spine. Bougies may be used gently, but one rarely obtains more information than from the use of the soft stomach-tube. The area of stomach tympany is usually reduced in extent. On inflation the patient frequently vomits immediately, or, if not, there is no increase in the gastric tympany.

With reference to the other symptoms of cancer of the stomach Robson says: "Bleeding is usually shown as grumous vomit, seldom as a large hæmatemesis as in ulcer, and melæna is rare. The pain is more constant than in ulcer and not so distinctly after food. It may be absent, but in one form or another is present in 90 per cent. of the cases, and is usually very severe. On examining the stomach contents after a test-meal the absence of free hydrochloric acid is very suggestive of cancer, as is the presence of free lactic acid; but the presence of free hydrochloric acid does not negative the existence of cancer. Loss of flesh occurs from the outset and cachexia supervenes at an earlier stage than in cancer elsewhere.

"It would seem almost incredible that cancer of the stomach may exist in a latent form and produce death by exhaustion without any of the characteristic symptoms, but four cases of this kind have been reported.

"Before a tumor is felt there may often be a difficulty in diagnosing between pernicious anæmia, tubercle, and cancer of the stomach; but when persistent indigestion comes on after fifty for the first time it is very frequently due to cancer. At times carcinoma can be diagnosed only by the resistance present when the patient is deeply anæsthetized."

An examination of the blood, while not in itself of very great value, may help to fix the diagnosis in a doubtful case. Osler and McCrae's conclusions are:

1. A blood-count below 1,000,000 red blood-corpuscles is strongly in favor of pernicious anæmia.

2. While nucleated red blood-corpuscles are present in all very severe anæmias, megaloblasts rarely if ever occur in cancer of the stomach.

3. Neither an increase in the leucocytes nor special variations in the forms appear to be of any moment in the diagnosis of cancer of the stomach.

4. The presence or absence of digestion leucocytosis is too uncertain to be of assistance in diagnosis.

Attention is called to the fact that there may be a great secretion of liquid into the dilated stomach, draining the tissues of water and producing a rapid emaciation, with harsh, dry skin. The blood examination will show that the blood is concentrated from loss of fluid. Patients in such a state of desiccation are unfavorable subjects for operation.

INDICATIONS FOR OPERATION. Macdonald mentions a combination of six symptoms which, to his mind, are sufficient to indicate the necessity for an exploratory operation: First, a chronic gastritis which is progressive in character under proper dietetic, medicinal, and physical treatment; second, a loss of gastric motility; third, progressive diminution of gastric peristalsis; fourth, a diminution of free hydrochloric acid, progressive in character; fifth, emaciation of the patient under forced diet; sixth, reduction of the hæmoglobin in the blood, progressive to 65 per cent. or under, and a moderate leucocytosis. It will be noted that the presence of hæmatemesis, lactic acid, the Oppler-Boas bacillus, and the epigastric tumor are omitted from this list of indications for operation, as these symptoms, as a rule, appear too late to permit of radical surgical intervention.

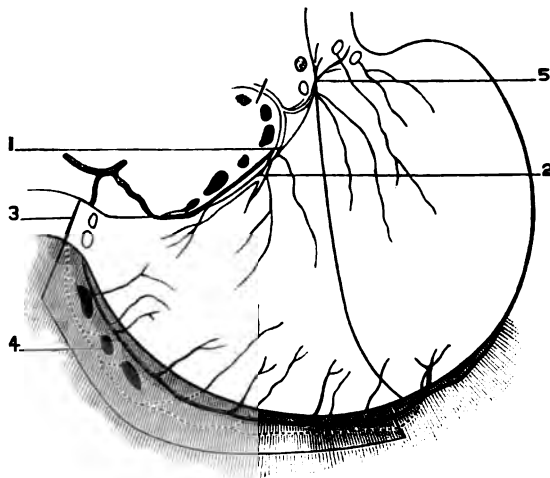
It is a good rule for those who carp at the surgeon because of his ill success in curing such terrible diseases as cancer of the stomach to consider the outlook for a patient in the hands of a physician. Here is Osler's description: "In cancer of the stomach the course of the disease is steadily downward, although a change of diet combined with lavage is sometimes followed by temporary improvement, but rarely by any increase in weight." Three-fourths of the patients in Osler's series died in less than a year from the first symptoms; one-half of them in six months. The rapid course of the disease in patients under thirty years of age has been spoken of above, but such rapid cases occur at all ages, even up to seventy-five years. "Occasionally, but rarely, two years or more will elapse between the first symptoms and the fatal termination. In this group of cases are to be placed the so-called latent cases, occurring chiefly in the aged, in which the symptoms are so slight that they are attributed to indigestion. The testimony of the post-mortem room corroborates this statement, for occasionally a carcinoma of the stomach is found involving nearly the whole organ, although the symptoms during life were insignificant."

The records of forty-three autopsies show that adhesions were present in a little more than one-half of the fatal cases. The omentum was adherent ten times; there were adhesions to the colon eight times; to the liver seven times; to the spleen four times; to the pancreas three times; to the duodenum and mesentery each twice, and the gall-bladder and diaphragm each once. Perforation occurred six times, but the adhesions shut off the escape of fluid in five of these cases. In 35 out

of 45 cases there was ulceration. There was dilatation of the stomach in 14 cases, in 12 of which the growth was at the pylorus.

METASTASES AND LYMPHATIC INVOLVEMENT. The presence of metastases is perhaps of greater interest to surgeons than any one complication; they were found in 39 out of Osler's 45 cases—that is, 86.6 per cent. Welch puts the occurrence of metastases at 63.4 per cent. Ewald puts it at 75 per cent. In Osler's 43 cases the lymph glands were infected 30 times; the gastrohepatic glands were affected 21 times; the peritoneal 9 times; posterior mesenteric 6 times; the supra-clavicular and posterior mediastinal 2 times; iliac, bronchial, pericardial, anterior mediastinal, and axillary each in 1 case. The liver was the seat of metastases in 23 cases; peritoneum in 11; pancreas in 8;

FIG. 37.



Drawing (schematic) showing groups of lymph nodes frequently infiltrated in carcinoma of stomach. 1 and 2. Lesser curvature. 3. Retropyloric. 4. Infrapyloric. 5. Retro-oesophageal. (CUNEO.)

bowels in 8 (small bowel in 3, colon in 2, duodenum in 1); kidney and lungs each in 4; pleura in 3; spleen and diaphragm each in 2; ribs, vertebræ, skull, ilium, femur, heart-muscle, pericardium, abdominal wall, vesicorectal cul-de-sac, hydrococele sac, and ureter each in 1 case.

This matter of lymphatic invasion is all important for those who purpose the complete removal of the tumor. Macdonald says that it occurs later in carcinoma of the stomach than in carcinoma of the breast, uterus, tongue, or rectum, patients often dying from pyloric cancer before any very extensive lymphatic invasion occurs. Perry and Shaw made a study of 38 autopsies in which the cause of death was carcinoma of the stomach and found absolutely no secondary deposits

in 18 per cent. of the cases. McArdle collected 802 cases of cancer of the pylorus, and in 496, or 60 per cent. of this number, there was no important lymphatic involvement. Gussenbauer and Winiwarter examined the autopsy records in 542 cases of carcinoma of the pylorus. In 41 per cent. of these cases there was no metastasis in other organs, and in 37 per cent. no adhesions were present.

It is also important to know the situation of infected lymph nodes, since their removal should be accomplished in every radical operation.

Fig. 37 is taken from a drawing by Cuneo. One group of glands lies along the lesser curvature in the gastrohepatic omentum, in close relation to the celiac axis and the hepatic bloodvessels; a second group is found along the greater curvature; a third behind the pylorus, while others are situated behind the œsophagus and along the outer border of the cardia.

MEDICAL VS. SURGICAL TREATMENT. The articles by Osler and Robson from which such free quotations have already been made afford the opportunity of comparing the opinions of the best type of physician with those of a radical but most careful surgeon. It is gratifying to observe how closely their views upon treatment coincide. Osler's chapter on treatment is a short one. He says the problem given is to nourish as well as possible an individual whose gastric functions are much interfered with. He has found the stomach-tube of great service both to relieve pain and to check vomiting. Even in patients without any dilatation occasional lavage is valuable. In such cases washing once in every two or three days is enough. Motor insufficiency is always an indication for the use of the tube, and it may exist without enlargement of the stomach. In cases with ulceration the washing removes adherent decomposing and irritating material. The history of hemorrhages and the presence of ulceration are no counter-indication to the use of the stomach-tube if ordinary gentleness be exercised.

In regard to surgical treatment Osler says: "The important aid of an exploratory operation should be more frequently advised. In other obscure abdominal disorders it is a common procedure—why not in gastric conditions? The risk is comparatively slight and is much less than that of an undiagnosed neoplasm. If in a suspected case, when under treatment, there is no improvement in a few weeks an exploratory operation is justifiable. In such cases permission should be obtained for radical operation if a growth be found. The operation should by no means be advised merely as a diagnostic measure in the case of a patient who is run down and anæmic. The risk is greater here, and a few unfortunate results would soon bring discredit on a procedure perfectly correct under other conditions. The question as to the advisability of operation often arises in later stages when only a palliative

procedure is possible. As a general rule, among our series the patients have stood operative interference worse than their general condition would have led one to anticipate. Nutrition and the organs of nutrition have suffered more than is supposed from outward appearance. After operation the impaired powers of digestion may be enough to turn the scale in the wrong direction. Rapidity of operation is an important point in such cases. A careful study of the blood before operation should be made, as marked anæmia with a low hæmoglobin percentage should be a bar to any but imperative operation. On the whole, our experience with exploratory operation as a diagnostic measure in obscure disorders of the abdomen has been most favorable. It has been very exceptional to have a case 'go wrong.' Stenosis of the cardia may be helped temporarily by the passage of tubes, though this treatment has little to recommend it. The best procedure is gastrostomy, which should be done early. To wait until the patient has become feeble and emaciated is to court death."

Turning now to the surgeon, Robson says: "Surgery holds out the only hope of relief or cure, and as the earlier these cases are seen by the surgeon the greater is the probability of real good being done, in every case where cancer of the stomach is suspected the question of surgical treatment should be considered at a much earlier period than is now the custom." Then, after quoting the figures given above to show that a considerable number of cases of cancer of the stomach terminate fatally before lymphatic involvement occurs, he says: "One may reasonably hope, therefore, to perform a radical operation in one out of three or four cases of cancer of the stomach if surgical means be adopted sufficiently early. Cancer of the stomach is more favorable for radical treatment than cancer of the breast or of the tongue, and now that the technique of the radical operation is becoming more perfect we shall in the future give our patients the chance of relief by operation more frequently, so that if we save only 50 per cent. by the radical operation it is well worth trying."

EXPLORATORY INCISION IN CANCER OF THE STOMACH. The first procedure in all cases thought suitable for operation will be an exploration. This of itself ought not to cause death. Robson performed it upon eight patients in whom the disease was found to be too wide-spread for radical treatment. The abdomen was therefore closed at once and all the patients recovered and lived for various periods. As such patients bear shock badly no effort should be omitted to minimize it. Loss of heat should be prevented by wrapping the patient from head to foot in cotton-batting. External heat can be applied during the operation by hot-water bags. Robson gives his patients an injection of strychnine before the anæsthetic and repeats it during the operation if necessary.

Saline fluid may be injected in considerable quantity into the subcutaneous tissues of the axilla during operation, and a pint of hot saline fluid with an ounce of brandy should be passed into the rectum immediately after the operation.

PYLORECTOMY. The operation of pylorectomy has been much modified since it was first performed by Péan and Billroth twenty years ago. At present three methods of performing the operation are in vogue. After the removal of the affected parts of the stomach and duodenum, the wound in the stomach may be reduced in size by sutures and then united with the duodenum by Murphy's button, so as to insure a permanent opening of good size; or the opening in the stomach may be closed completely and the duodenum or some portion of the jejunum may be utilized to form an anastomosis with the stomach; or, thirdly, a gastro-enterostomy may be done and the tumor at the pylorus removed some weeks or months afterward, when the patient is in a better condition to withstand the shock of the major part of the operation.

Robson has grouped together records of 572 cases of pylorectomy or partial gastrectomy, showing an operative mortality of 30.4 per cent. Haberkant's statistics showed that if adhesions were extensive the mortality was 72.7 per cent., whereas if no adhesions were present the mortality was only 27.2 per cent. The results of different methods of operating are shown by the following table:

	Cases.	Deaths.
Pylorectomy, with end-to-end anastomosis	148	56= 37.8 per ct.
“ with terminal and lateral anastomosis	64	10= 15.6 “
“ with lateral anastomosis	54	24= 44.4 “
“ by invagination	4	4=100.0 “
“ in two stages	3	0= 0.0 “

If the cardiac end of the stomach be involved resection presents two special difficulties—danger to both pneumogastric nerves and the difficulty of isolating the cardiac end of the œsophagus and fixing it to the portion of the stomach that is left.

PARTIAL GASTRECTOMY. If the growth is limited to the body of the stomach partial gastrectomy may be done by a free circular or elliptical incision. It is usually advisable to close the gastric openings and establish a gastro-entero-anastomosis through a separate wound. The edges of the opening caused by the removal of the tumor should be sutured by chromicized catgut applied continuously through the mucous membrane and interrupted Lambert sutures through the peritoneal coat. There are records of fourteen cases of removal of at least three-fourths of the stomach for cancer. Four of these patients died from operation, a mortality of 28.5 per cent.

COMPLETE GASTRECTOMY. Complete gastrectomy has been performed, as far as known, eleven times upon the human subject. The

first patient died upon the table. Three others died within the space of a few hours from the time of operation, giving a mortality of 36.4 per cent. The other seven patients recovered and made a good gain in health and strength. One died in nine and another in fourteen months, but the other five were yet living at the time of the report, one, four, seventeen, eighteen, and twenty months respectively after operation. It is scarcely necessary to say that before deciding upon a complete gastrectomy the surgeon should convince himself by a careful examination that the adjoining organs are not affected by the disease and that there are no secondary deposits in the lymph glands.

GASTROSTOMY. This operation has received an unfortunately bad reputation partly because it has been generally postponed until the reparative powers of the patient were gone and partly on account of

FIG. 38.

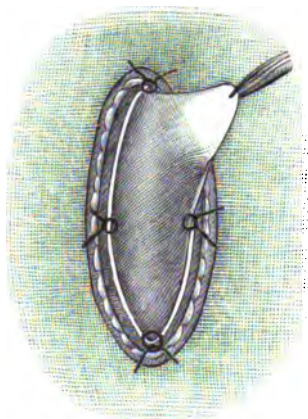
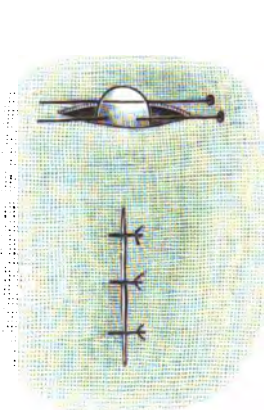


FIG. 39.



faulty technique. The latter difficulty no longer exists, as several methods of operating, providing a satisfactory and permanent opening in the stomach, have been devised and have stood the test of experience. Robson prefers a modification of the Ssabanejew-Frank method, which he performs as follows: A vertical incision an inch and a half long is made over the outer third of the left rectus abdominis, commencing three-quarters of an inch below the costal margin. The fibres of the rectus are separated, but not divided, to the extent of the incision, and the posterior part of the rectus sheath and peritoneum are divided together, the opening being an inch in length. A portion of the cardiac end of the stomach is then brought up through the wound and held forward by an assistant until four sutures are inserted into the base of the cone by means of a curved intestinal needle, thus fixing the visceral peritoneum of the stomach to the edges of the parietal peri-

toneum. A transverse incision half an inch long is then made through the skin an inch above the upper end of the first cut, and by means of a blunt instrument, such as the handle of a scalpel, the skin is undermined so as to connect the two openings beneath a bridge of skin and subcutaneous tissue. A closed pair of pressure forceps is introduced through the upper incision as far as the projecting part of the stomach and made to grasp the most prominent part (Fig. 38), which it draws up to and beyond the surface of the second opening, in which it is retained by means of two hare-lip pins (Fig. 39).

It should just fill the opening and should require no sutures. The lower opening is now closed by two or three silkworm-gut sutures or by a continuous stitch, and the edges are dried and covered with collodion and gauze. If needful the stomach can be opened at once by a tenotomy knife introduced between the pins, but, if possible, the opening should be deferred for twenty-four hours, when a barrier of lymph will have been thrown out.

After opening, a No. 8 to No. 12 soft catheter is inserted, to which a piece of tubing is fixed, and by means of a funnel the patient can at once be fed with warm milk and egg or whatever liquid may be thought desirable. The catheter may be left in position for a few days, after which it is easy to insert it whenever a meal is required.

If the patient is much exhausted an anæsthetic may be dispensed with and cocaine employed, as the only pain is caused by the skin incision. Robson has performed this operation satisfactorily on patients whose ages ranged from one year to eighty years.

He collected the reports of 769 cases of gastrostomy showing that the mortality for the whole series was 44.2 per cent. This means little, however, as nearly all of the patients operated upon fifteen and twenty years ago died, while a large part of those recently operated upon recovered. Probably if all the inoperable cases came to operation while still in a fair condition the mortality from the operation would not exceed 10 per cent.

Downie and Kennedy contrast the immediate and late effects of gastrostomy as performed according to Frank's or Witzel's method. In Witzel's operation the opening is lined by the serous coat of the stomach in its inner half and by granulation tissue in its outer half. It therefore undergoes contraction very readily, and a patient must usually wear the tube between meals in order to keep the opening patent. In Frank's operation the opening is lined by mucous membrane and the tube can be left out between meals in most cases. The valvular action in Witzel's operation being due to the obliquity of the canal it is not likely to decrease with the lapse of time. The valvular action in Frank's operation depends on the cone of the stomach which is attached to the

skin through an opening in the rectus muscle. If the muscle atrophies or the opening in it dilates this valvular action may be lost. A remote result of Frank's operation is the production of a ventral hernia at the site of opening through the rectus muscle. In Witzel's operation the stomach has to be opened at once, while in Frank's the opening can be made a day or so later, when adhesions have formed. Thus the risk of sepsis is reduced to a minimum. In some instances a contracted or indurated stomach may prevent the proper performance of Frank's operation; under other circumstances it is probably the operation of choice.

GASTRO-ENTEROSTOMY. With regard to gastro-enterostomy for cancer, Robson has this to say: "For giving relief in obstruction due to cancer of the pylorus that cannot be removed, as also in many cases of simple stricture, some surgeons advocate gastro-enterostomy to the exclusion of all other operations; but it must not be forgotten that gastro-enterostomy is merely palliative, and therefore cannot be considered on the same level with operations that may prove curative by the complete removal of the disease.

"The mortality of gastro-enterostomy is much greater in cancer than in simple ulcer. Taking all collected cases together from reports by Mikulicz, Doyen, Carle, D'Ewald, Czerny, Chlumskiji, Haberkant, etc., I find that the mortality is 36.4 per cent. It is rare for a patient with cancer to survive the operation for a year, and the average duration is probably only from four to six months. Later statistics are much better than the earlier ones, and the results in cases operated on 'in time' are really good. The reason of the high mortality is undoubtedly the low state of the patient when placed under the care of the surgeon."

When the diagnosis points to cancer the question of operation should be at once considered.

G. Kelling,¹ of Dresden, presents his views on the surgery of the stomach in a very extensive paper recently published. The main points of the same are briefly as follows: Gastro-enterostomy is indicated where the normal passage through the stomach (hour-glass stomach), the pylorus, and the upper duodenum is made difficult in consequence of mechanical causes; on the other hand, obstructions in the lower portion of the duodenum or the upper part of the jejunum should never be treated by gastro-enterostomy; they should be directly removed.

Gastro-enterostomy is further indicated if a rapid evacuation of the stomach contents be required. In such a case the fistula had best be established in the fundus portion of the stomach and the pylorus closed.

¹ Arch. f. klin. Chir., 1900, vol. lxii., Nos. 1 and 2.

In the closure of the pylorus lies the only guarantee for the continued patency of the gastro-intestinal fistula. Beside it effects a more rapid evacuation of the stomach contents and acts against the "vicious circle."

In case of enteroptosis the posterior wall of the stomach is preferable for gastro-enterostomy.

In very flabby stomachs Roux's method is to be primarily considered; entero-anastomosis should here be added to gastro-enterostomy. In hypertrophied stomachs—thus, generally in stenosis of the pylorus—the entero-anastomosis may be omitted if a method is employed that positively excludes the formation of a spur.

The formation of a spur is caused by the disproportion between the size of the fistula and the circumference of the opposite intestinal wall, and this may be avoided by a certain technique. If the fistula is sutured in the ordinary way by means of continued suture, entero-anastomosis will have to be added.

The distance of the entero-anastomosis from the gastro-entero-anastomosis, measured on the afferent shank, should not exceed 10 cm.

As regards the durability of the suture, the diet is of importance. The strain from larger quantities of fluid is by far less than from even small amounts of solid food. Solid bodies may cause perforation of the sutures.

The rapid evacuation of the gastric contents after gastro-enterostomy is due to the fact that the motory checking of the stomach on filling of the duodenum ceases almost entirely.

The influx of bile and pancreatic juice into the stomach is not connected with injurious consequences.

Hydrochloric acid is more poorly neutralized after gastro-enterostomy than if it had to pass the duodenum, and it has an irritating effect upon the intestine. In weakly individuals with hypersecretion it will be best to take as high a loop as possible (von Hacker's method with entero-anastomosis).

The disadvantages of gastro-enterostomy will find compensation in course of time. This compensation, however, is dependent upon a certain regenerative capacity of the organism. It is, therefore, important in cases where gastro-enterostomy is indicated not to wait too long, but to operate before the patient becomes too greatly weakened by the disease.

A normal procedure of gastro-enterostomy ought to offer the greatest reliability as regards the functions and the least disadvantages. As such the method of von Hacker with entero-anastomosis may be mentioned. In case of an open pylorus it is best to suture the same in order to secure good functioning of the gastro-intestinal fistula.

Reiske,¹ in his paper entitled "Four Cases of Gastro-enteroplasty or Enteroplasty," refers to a treatise by Mikulicz on "The Surgical Treatment of Chronic Tumors of the Stomach," in which two tables are given covering cases operated upon at the clinics of Billroth, Czerny, and Mikulicz and which show the respective results of resection of the pylorus, gastro-enterostomy, and pyloroplastic operations. The mortality of these operations, according to the combined statistics up to 1897, is 23.6 per cent. for gastro-enterostomy and 15.6 per cent. for pyloroplastic operations. It is interesting to note how the frequency of the various operations has changed in the course of time. While during the period before 1890 resection occupied the first place and pyloroplasty the last, we find this relation reversed in the period after 1890; gastro-enterostomies always occupied the second place. The exact proportion was as follows :

	Before 1890.	After 1890.
Resections of the pylorus	28	18
Gastro-enterostomies	23	68
Pyloroplastic operations	21	76

This statement refers only to benign affections of the stomach.

At Czerny's clinic 28 gastro-enterostomies for benign affections of the stomach were performed up to the end of 1897, with 4 deaths, or a mortality of 14.3 per cent.; 11 pyloroplastic operations, with a mortality of 9 per cent. Owing to the unsatisfactory after-results the latter operation has been discontinued at the Heidelberg clinic since the beginning of 1896.

Of the four cases reported one was operated upon at Mikulicz's clinic; the other three at Czerny's. In all of them chronic tumor of the stomach with benign stenosis of the pylorus furnished the indication for the first surgical intervention. In one case anterior gastro-enterostomy was performed; in the others posterior gastro-enterostomy according to von Hacker. The result in these cases was unsatisfactory, the symptoms of stenosis returning in all of them. The cause for the latter was formation of a spur in one instance; in another extensive adhesions of the spleen at the site of the anastomosis; in a third cicatricial contraction of the fissure of the mesocolon by which the jejunum was stretched so that the lumen became contracted. In the fourth case—that of Mikulicz—the cause of the returning trouble is not plainly stated.

The plastic operation by which Mikulicz tried to overcome the symptoms of stenosis, and which Czerny likewise independently performed for the same purpose, is covered technically by the Heinecke-Mikulicz pyloroplasty.

¹ Beitr. z. klin. Chir., 1900, vol. xxvii., p. 785.

The constriction is split longitudinally in the direction of the muscular layers of the stomach or intestine and is sutured transversely in several layers.

In enteroplasty the intestine alone was opened and in gastro-enteroplasty the stomach and jejunum, about 2.5 cm. from the constriction. After splitting the serosa and muscularis the jejunum was opened first in gastro-enteroplasty, and from there the splitting of the constricting ring was undertaken. Silk-button sutures were used.

Mikulicz combined entero-anastomosis with the plastic operation.

The interval between gastro-enterostomy and the plastic operation was about two months in three of the cases ; in the fourth, over two years.

As regards the results of these gastro-enteroplastic operations, those performed at Czerny's clinic are really brilliant. Mikulicz did not obtain a lastingly good result from his combination operation, as is shown by the history of the case.

It may be mentioned that in one of Czerny's cases he was obliged to perform three laparotomies, as neither enteroplasty nor gastro-enteroplasty done four months later yielded a favorable result, and it became necessary to loosen adhesions of the spleen that were present.

Reiske adds another successful case of pure enteroplasty performed by Czerny for stenosis of the intestine after incarcerated hernia, and states that by these four operations Czerny has introduced a method which makes it possible to overcome benign stenosis of the stomach.

It certainly is natural, Czerny states, that we should, in cases of recurrence after gastro-enterostomy for benign stenosis of the pylorus, first think of mechanical causes of these symptoms and then try to overcome them.

EFFECTS OF GASTRO-ENTEROSTOMY. The question as to the late effects of gastro-enterostomy is an interesting one. Hartmann and Soupoult found that the stomach regained its normal dimensions in some cases quite rapidly, but more often in benign than in malignant cases. Whether or not this cure of the dilatation can take place seems to depend on the condition of the muscular coat at the time of operation. A very pronounced atrophy or an extensive infiltration of the muscular layer will retard or altogether prevent the return of the stomach to its normal condition. In other cases the selection of an unsuitable coil of intestine, or a too small anastomatic opening or the presence of adhesions, seems to frustrate attempts at restoration. The quantity of gastric juice may diminish very much after gastro-enterostomy. Moreover, its acidity may greatly diminish or disappear altogether. They explain these changes upon the supposition that the pyloric stricture causes a hypersecretion of gastric juice, which disappears as soon as the anastomosis is established.

DIGESTIVE POWER OF THE STOMACH FOLLOWING GASTRO-ENTEROSTOMY FOR BENIGN STRICTURE OF THE PYLORUS. Fischer made a careful study of four patients who were operated upon, a posterior operation being performed in every instance. He had the advantage of having observed these patients for a considerable time previous to operation as well as for many months after gastro-enterostomy was performed. The immediate effect of gastro-enterostomy in cases of benign stricture is a relief following naturally as a result of the cessation of the spasm of the pyloric sphincter. This relief is apt to produce an exaggerated idea of the ultimate effects of the operation. Moreover, this relief is apt to lead the patient to eat things which are not good for him and which, by causing a return of dyspeptic symptoms, may greatly disappoint him and retard the repair of the gastric functions.

In two of the cases mentioned there was primary pyloric obstruction, with secondary hyperacidity and dilatation. Repeated analyses made prior to operation showed that the hyperacidity was subsequent to and progressive with the obstruction. In these cases the hyperacidity persisted more than two years after gastro-enterostomy. The persistence of this hyperacidity can be explained only on the supposition that the mucous membrane of the stomach had proliferated under the influence of long-continued irritation. In the third case there was primary functional hyperacidity, with secondary pyloric spasm and dilatation. The obstruction, in other words, was the result of the hyperacidity. The acidity in this case depended upon the general nervous condition of the patient, and showed a tendency to become normal or even subnormal during favorable periods both before and after operation, and to increase as a result of mental excitement.

The fourth case was one of primary neurotic atony, with secondary subacidity and dilatation. There can be no question as to the diagnosis in this case, since repeated examinations of the stomach were made for four years prior to operation, beginning at a time when there was very little dilatation. Although the general condition of the patient was improved by the operation, the subacidity progressed steadily.

In the first two cases—those in which stricture antedated hyperacidity and dilatation—the motor power of the stomach was much improved by operation and the dilatation and gastroptosis became less. The motor power was also much improved in the third and fourth cases, although in the latter—a case of primary neurotic atony—the dilatation was apparently not affected by the operation. These findings coincide with observations made at surgical clinics. The organ returns to a normal condition of size and motility in those cases in which the enlargement and impaired muscular activity are relative and due to

obstruction. The conditions must not, however, have gone too far and the subsequent life of the patient must be favorable. If, on the other hand, enlargement and atony are positive and part of the constitutional condition, little or no improvement is to be expected in the size of the stomach, although even then an opening made at its most dependent portion will greatly aid it in emptying itself. The condition of the intestines is much improved by gastro-enterostomy. The relief of the pyloric spasm relieves the tonic spasm throughout the intestines which is induced by spasm at the pylorus. The results after gastro-enterostomy for carcinoma cannot, in the nature of things, be as satisfactory as those obtained when the stricture is benign.

Ulcer of the Stomach. Mayo Robson divides ulcer of the stomach into four classes: (a) *Simple erosions* which may be easily overlooked at autopsy, but which can give rise to alarming hemorrhage during life. (b) *Exulceratio simplex* of Dieulafoy—a condition in which the surface layers of the mucous membrane are removed to such an extent that the arterioles running under the muscularis mucosæ are exposed. This form of ulceration may give rise to terrible hemorrhage that may prove rapidly fatal. (c) *The acute, round ulcer* of chlorotic young women. (d) *The chronic ulcer*, irregular in outline, with thickened edges, and which may occur in both women and men. No hard-and-fast line is to be drawn between the acute and chronic forms of ulceration.

Robson says that the position of the ulcer may frequently be ascertained from the effect of posture upon the pain. If the ulcer is at the pylorus the patient is easier on his left side; if it is at the cardiac extremity lying on the right side will often give relief. Most latent ulcers are situated in the lesser curvature near the cardiac extremity, and hence are free from pressure of the food, especially in the erect position.

The differential diagnosis between ulcer and cancer is not always easy. The stomach contents in dilatation due to ulcer have an yeasty smell; those of a cancerous stomach have an habitual fetid odor. The coffee-ground appearance of vomited blood is an unreliable symptom, since it may occur in ulcer, and a more profuse hæmatemesis is not unknown with cancer. Cancer is a disease of months, and chronic ulcer with tumor an affection of years. The tumor in cancer is nodular and can be freely handled; that around an ulcer is smoother and markedly tender.

An exploratory operation is a great help in making the diagnosis, but it should never be performed if it is going to add seriously to the risk of life unless it is possible that good will result from the exploration.

Only a few years ago ulcer of the stomach was considered an affection demanding purely medical treatment. Later a few surgeons began to operate upon desperate conditions which were the early or late results of ulcer of the stomach. Perforation of the stomach is one of those complications in which the surgical treatment has been so thoroughly demonstrated that there is little more to be said on the subject. Other complications due to gastric ulcer are also amenable to appropriate surgical treatment, although the treatment of gastric ulcer *per se* is in its beginning a medical one and must always be regarded as such. Indeed, if all cases of gastric ulcer were thoroughly treated in the first place by prolonged rest in bed and a rigid diet there would be far fewer complications for the surgeon.

Robson mentions the following list of complications most of which are amenable to surgical treatment :

Perforation of the stomach wall.	Severe gastralgia.
General peritonitis.	Persistent vomiting.
Hæmatemesis.	Tetany.
Melæna.	Acute or chronic pancreatitis.
Perigastritis ending in suppuration.	Abscess of liver.
Perigastritis producing adhesions.	Chronic hepatitis.
Subphrenic abscess.	Profound anæmia.
Tumor of pylorus or stomach.	Pressure on or stricture of bile-ducts, with jaundice.
Contraction of pylorus.	Catarrh of gall-bladder from adhesions.
Dilatation of stomach.	Great loss of flesh and strength ending in phthisis.
Hour-glass contraction.	Cancer secondary to ulcer.
Fistula between stomach and adjoining organs.	
Atonic motor deficiency.	

SURGICAL TREATMENT. As the number of patients operated upon has increased, the percentage of mortality has diminished. Robson believes that mortality of all operations upon the stomach for non-malignant difficulties will not be more than 5 per cent. The surgical treatment of intractable or relapsing gastric ulcer is in the greater number of cases the only satisfactory method, and operation should be resorted to at a much earlier period than has hitherto been the custom and always before patients are so far reduced by pain and starvation or the supervention of serious complications that their weakened condition renders any operation a serious matter.

Gastro-enterostomy, of all operations, is the one to rely on in the treatment of gastric ulcer. Robson prefers the posterior operation, and joins the stomach and first part of the jejunum by two continuous sutures around a decalcified bone bobbin. His last twenty cases have all recovered without severe pain, vomiting, or any drawback.

The drainage of the stomach leads to a cure of the ulcer, and its excision is, as a rule, unnecessary.

Pyloroplasty must not be performed in the case of active ulceration of the pylorus itself unless the ulcer be excised. If this rule is neglected stenosis is likely to recur. If the pylorus is free from adhesions and contains no active ulcer, pyloroplasty is easily carried out and gives a good result.

Pylorectomy is unnecessarily severe and presents no advantage over gastro-enterostomy.

Gastroplication should be performed if the dilatation of the stomach is a marked feature. A simple and satisfactory method is shown in Fig. 40.

A chronic ulcer in the middle of the stomach is apt to produce a condition known as hour-glass contraction, which may be treated by one of three methods :

a. *Gastroplasty*, which consists in laying open the stricture longitudinally and bringing the edges of the wound together transversely.

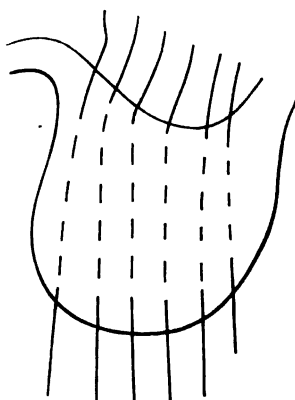
b. *Gastro-enterostomy*, uniting the first cavity of the stomach with the jejunum.

c. *Gastro-gastrostomy*, or uniting the two stomach cavities by a new channel.

Robson proposes the name of *gastrolysis* for the division of adhesions set up by perigastritis. Such adhesions may prevent an ulcer from perforating, but they may also prove a source of trouble and danger, causing great pain, retarding the passage of food, producing dilatation, etc. He has operated on over fifty cases for the detachment of the pylorus and stomach. This new chapter of surgery is a most interesting one, and it is not surprising that one who has had such marked success along this line should speak hopefully of the future. He says : "The treatment of gastric ailments apart from cancer is only a recent encroachment of surgery, but I venture to think that it is not one of the least important ; and I consider that the cure of some of the chronic dyspeptics, who are not only a source of misery unto themselves but the source of much domestic affliction to others, will confer as great a boon on suffering humanity as the cure of many of the chronic and hopeless invalids whose residue of life could for the most part only be of short duration and at the best one of suffering and distress without surgical treatment."

PYLOROPLASTY AND GASTRO-ENTEROSTOMY. Moynihan says that the recurrence of stenosis after pyloroplasty is due rather to faulty selection of the patient than to any inherent defect in the method. Three points in this connection deserve special attention in order to insure success :

Fig. 40.



Gastroplication.

1. The scar of the ulcer must be small in size, especially in width, and be sharply defined. There must be no cicatricial infiltration, with the exception of the small sclerosed area, and the bowel walls must be soft and supple.

2. The incision dividing the stricture must be of adequate length and must be continued on each side well into healthy tissue.

3. There must be no peripyloric adhesions of any—even the most trivial—kind.

He believes that gastro-enterostomy is an operation far more frequently called for than pyloroplasty. The result of ulcer situated near the pylorus is in most cases a cicatricial induration which is either diffuse or is associated with adhesions between the pylorus, duodenum, abdominal wall, liver, gall-bladder, etc. Under these circumstances pyloroplasty is manifestly less suitable than gastro-enterostomy.

Moynihan finds that the stomach, if previously dilated, undergoes a decided diminution in the first three weeks after gastro-enterostomy. It does not, however, return to its normal size. The opening between stomach and intestine shows no tendency to become too small. Improvement in the health and general condition of the patient after successful gastro-enterostomy is most striking. Appetite returns with the power of appeasing it; food is taken with relish; pain is altogether lost; weight is gained, sometimes with amazing rapidity, and the patient experiences that *joie de vivre* which comes with a return to bodily health.

STRICTURES OF THE PYLORUS DUE TO CAUSTICS. In a paper on this subject read before the Twenty-ninth Congress of the German Society of Surgery, Berlin, April 20, 1900, von Eiselsberg¹ states that of the 129 operations upon the stomach—excluding gastrostomies—done by him within the last four years at Königsberg, 30 were resections, with 6 deaths; 82 gastro-enterostomies, with 13 deaths; 10 gastroplasties, with 2 deaths; 7 jejunostomies, with 2 deaths.

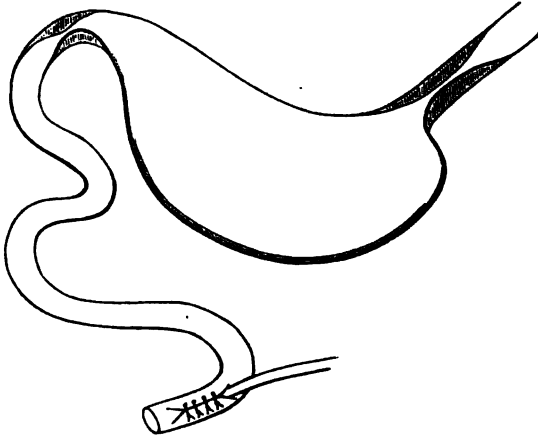
Seventy-three of these were performed for carcinoma; 56 for ulcers. Of the latter 8 were resections, with 1 death; 37 gastro-enterostomies, with 5 deaths; 10 enteroplasties, with 2 deaths; 1 jejunostomy.

Of the 56 operations performed for non-carcinomatous diseases 4 were strictures due to caustics (*Verätzungs-Strikturen*). Outside of this von Eiselsberg operated upon another patient, as assistant at Billroth's clinic, and still another patient was operated upon by von Eiselsberg's assistant, Dr. Bunge, in April of 1900; so that his report covers in all 6 cases of stricture due to caustics. Resection was done once;

¹ Arch. f. klin. Chir., 1900, vol. lxii., No. 1.

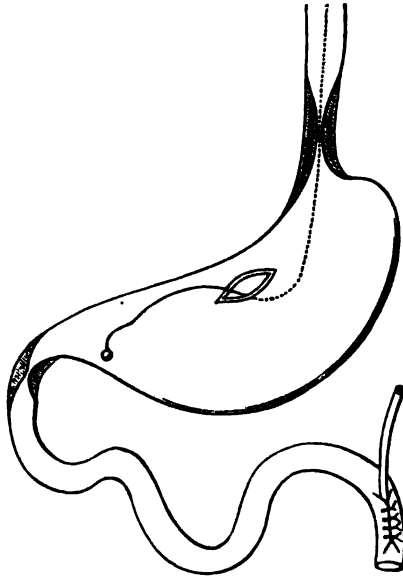
gastro-enterostomy four times, with one death ; and in the sixth case a number of operations were performed.

FIG. 41.



Jejunostomy for stricture of œsophagus and pylorus. (EISELSBERG.)

FIG. 42.

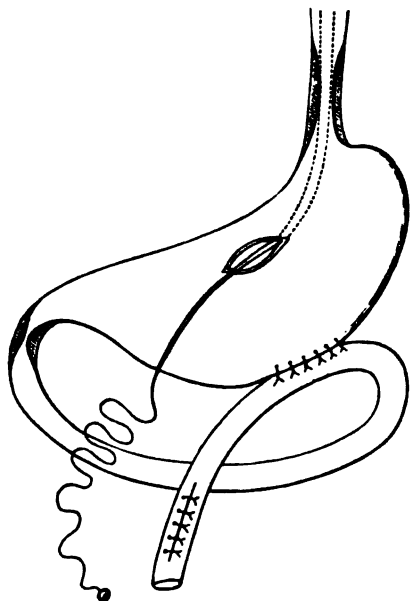


Gastrostomy and dilatation of œsophageal stricture. (EISELSBERG.)

In two instances the caustics were taken by mistake ; in four on purpose. Twice it had been hydrochloric acid, once each sulphuric acid and aqua fortis ; in the other two cases nothing was known as to

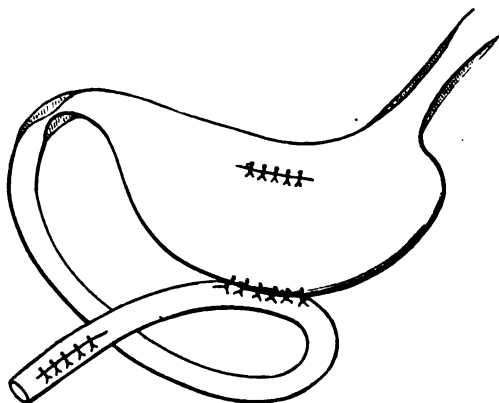
the nature of the caustic. The patients entered the clinic four, five, six, seven, eight, and twelve weeks after taking the caustic. The diagnosis was easy in every one of the cases. In five the pylorus only was

FIG. 43.



(Gastro-enterostomy after dilatation of œsophageal stricture. (EISELSBERG.)

FIG. 44.



Final result. Cure. (EISELSBERG.)

injured, the œsophagus being entirely free from changes causing discomfort to the patient. In one case the pylorus and œsophagus were both involved.

The time that had elapsed since operation was two years in three cases ; in two cases a few months only, so that nothing can be said as to permanent results. In the sixth case the patient died of suppurative bronchitis.

Von Eiselsberg believes that his case of resection of the pylorus was the first successful one for stricture due to caustics ; it has since been repeated by others. In the light of our present experience he thinks the operation has become superfluous, in view of the much simpler operation of gastro-enterostomy. It should come into consideration only in cases in which the tumor, due to the caustic, causes severe pain or hemorrhages, which may not be overcome by gastro-enterostomy alone.

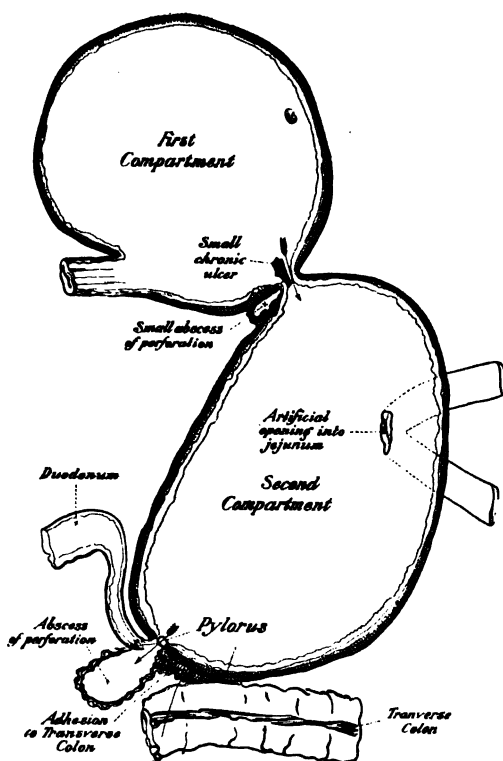
The simplest interference, von Eiselsberg states, is probably gastropasty. It was attempted in two of his cases, but could not be carried out on account of the great length of the stricture. Selenkow has done it five times in strictures resulting from caustics, with one death. Gastro-enterostomy, he says, will no doubt remain the operation of choice in this class of cases. He performed the same three times posteriorly and once anteriorly to the transverse colon. Von Eiselsberg states that he does posterior gastro-enterostomy whenever possible, and in general prefers suture to the Murphy button. He strongly emphasizes the importance of exact suture of the mucous membrane, as that will secure the firmness of the suture, and contraction or obliteration of the fistula as observed by some operators (König) will not occur.

Jejunostomy, he believes, is rarely indicated except in cases in which haste is necessary or in which in addition to the pylorus the œsophagus is strictured. The same can be looked upon only as a palliative measure that will later have to be followed (as in the case reported by him) by gastro-enterostomy followed by jejunorrhaphy. Von Eiselsberg mentions an exceptional case, however, observed by him at Utrecht in which stenosis (ulcer ?) of the cardiac orifice of the stomach and of the pylorus was completely and permanently cured by simple jejunostomy, the patient being perfectly well six years after operation ; also in very extensive ulcerative processes of the stomach, where gastro-enterostomy was contraindicated for several reasons, jejunostomy has been of excellent service. That it is of great value in cases of carcinomatous stenosis of the pylorus that are no longer amenable to treatment by gastro-enterostomy, von Eiselsberg has had occasion to observe in three cases quite recently.

HOURLY GLASS STOMACH. Martin and Pollard performed gastrojejunostomy upon a young woman with ten years' history of gastric ulceration and stenosis of the pylorus. The patient died in five days. At autopsy an interesting condition of affairs was found. The stomach

was almost completely divided, the channel which connected the two portions being not over half an inch in diameter. There was also stricture of the pylorus. At both of these sites of stricture was a small ulcer, with perforation, and a chronic abscess of small size. As this hour-glass stomach was not recognized either before or at the time of operation, an anastomosis was made simply between the second portion of the stomach and the jejunum. This was, of course, insufficient to relieve the patient of her symptoms. The condition is clearly shown in Fig. 45. The only

FIG. 45.



Hour-glass stomach with stricture of pylorus. The gastro-enterostomy failed to give relief. (MARTIN and POLLARD.)

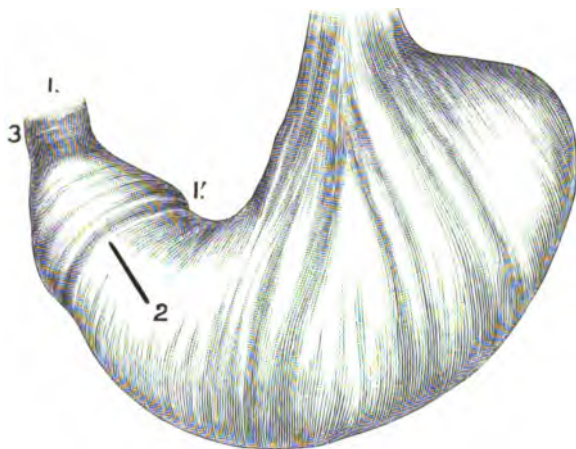
symptom noticed during life which might have suggested the condition of the stomach was the fact that when a given quantity of fluid was introduced into the empty stomach by the stomach-tube the whole quantity could not always be recovered.

Shattuck and Conant report a case of hour-glass stomach which was cured by a three-inch incision through the constricting portion, the sutures being introduced transversely according to the Heinecke-Mikulicz method. The interesting feature of this case is the fact that the stomach

was carefully blown up previous to operation and there was no evidence of an hour-glass contraction, although at operation the stricture between the two portions of the stomach barely admitted the finger. The patient recovered.

CONGENITAL HYPERTROPHIC STENOSIS OF THE PYLORUS is discussed by Nicoll, who reports a successful pyloroplasty for its relief. The exact nature of this condition and its cause are somewhat obscure. The stomach may be hypertrophied, or dilated, or normal. At the pylorus is invariably found a funnel-shaped circular thickening of the organ, tapering to an apex at or beyond the pylorus. The microscopical examination shows that the thickening of the pyloric ring may be due to a hypertrophy of one or both muscular coats or to an increase in

FIG. 46.



Diagrammatic representation of conditions found at the operation. 1. 1'. Bulky firm ring of (fibromyomatous?) tissue constituting a funnel at the pyloric end of the stomach, and tapering to its densest and narrowest part at 3. 2. Incision in stomach wall during operation.

submucous fibrous tissue. It is considered that surgical relief offers the only escape from an otherwise fatal condition. So far as known four patients have been operated upon—two by gastro-enterostomy, with fatal result; one by pyloroplasty, with recovery; while in the author's successful case an incision was made into the stomach and the stricture forcibly dilated from above.

In some cases symptoms have been present from birth; in others they have manifested themselves after an interval of days or weeks. There has been fairly constant vomiting of normal or coagulated or fermented milk. Constipation is marked. Emaciation is progressive and ultimately extreme. As the child grows thin peristaltic gastric waves may be evident, and periods during which the stomach is con-

tracted like a ball, alternating with periods of dilatation ; or there may be constant dilatation of the stomach, more marked on account of the emptiness of the intestine. In a few cases a pyloric tumor has been made out.

GASTRIC HEMORRHAGE. Rodman says that hemorrhage from the stomach may result from ulcer of the stomach, duodenal ulcer, gastric carcinoma, cirrhosis of the liver, vicarious menstruation, post-operative hæmatemesis, purpura hemorrhagica, miliary aneurisms, aneurisms of the aorta and other vessels, leucæmia, typhoid, yellow, and other infectious fevers, valvular disease of the heart, and various kinds of traumatism.

Gastric ulcer is, of course, the most important cause of gastric hemorrhage.

Hæmatemesis occurs in at least 50 per cent. of all cases of gastric ulcer, and many authorities estimate it as present in 80 per cent. It is fatal in 8 per cent. of the cases in which it occurs, according to the conservative estimate of Leube.

The first hemorrhage in all cases should be treated by medical measures, ice, astringents, opium, or copious hot enemata, as practised with success by Trippier. Possibly the second hemorrhage should be treated in like manner ; subsequent ones demand surgical treatment for recurring hemorrhage just as recurring attacks of appendicitis will sooner or later prove fatal, and should, like that affection, be treated radically ; and, to carry the parallelism further, the best time to operate is between the attacks.

The records of autopsies have shown that it is impossible to diagnose with any degree of certainty the source of the hemorrhage. There is no constant relation between the size of the vessel and the amount or rapidity of the hemorrhage. Large and rapidly fatal hemorrhages may take place from capillaries.

Rodman has collected 63 cases of operation for acute and chronic hemorrhage complicating gastric ulcer. There were 31 operations for frequently recurring hemorrhage, with 6 deaths, or a mortality of 19.3 per cent.; there were 32 operations for acute hemorrhage, with 13 deaths, or a mortality of 40.6 per cent. A study of these cases will convince any fair-minded man that none was operated upon too early and many were operated upon too late.

Of the various operative measures which have been carried out for treating gastric hemorrhage, gastro-enterostomy has been the most frequently employed and is evidently the choice of both American and foreign surgeons. In the first place it may be difficult to locate the bleeding-point, even with the aid of a suitable electric light. Moreover, statistics show that in about one case in five more than one ulcer

exists, so that even if the offending ulcer is excised there is no guarantee that hemorrhage will not recur from another one.

Of gastro-enterostomies for hemorrhage there have been thus far 13 cases, with 3 deaths, or 23.7 per cent. mortality—not a bad showing when it is remembered that in several instances it was carried out after other methods had failed.

In small but frequently repeated hemorrhages the operation finds its best field. In 12 cases of this kind its mortality has been *nil*—a most encouraging showing and one which should lead to more frequent operation in cases of this kind.

If the ulcer is situated either at the pylorus or upon the anterior gastric wall, and is reasonably free from adhesions, it should be removed. One is justified in undertaking a radical operation, even in the face of moderate adhesions, on account of the actual danger from hemorrhage and the probability of subsequent perforation. Of the 10 cases thus treated 8 recovered promptly, giving a mortality of 20 per cent.

Moullin opened the stomach three times on account of dangerous and repeated hemorrhage from gastric ulcers. In two of the patients the ulcers were near the cardiac orifice. As this portion of the stomach cannot be brought into the opening as made into the anterior wall, Moullin made use of a large vaginal speculum for exploration. By this means the bleeding-points were discovered without difficulty. When the source of the hemorrhage has been discovered a silk ligature should be passed beneath the vessel in order to constrict it. If the surgeon fails to accomplish this result he should not hesitate to pass the ligature through the whole thickness of the stomach wall, or, by lifting up the bleeding-point from within the stomach, a ligature may be tied around the base of the little cone thus formed. Moullin treated his three patients by ligation without excision of the ulcer, and all three recovered.

Spencer reports three cases of recurrent gastric hemorrhage. In one case, as no ulcer could be discovered, pyloroplasty was performed, with the effect of completely stopping the hemorrhage, which had recurred at intervals for a period of twenty years. The second patient gave a history of five attacks of hæmatemesis in ten years. An ulcer was found in the anterior wall about a third of the way from the pylorus to the cardiac orifice. In its base were a large artery and vein. These vessels were ligated, and the floor of the ulcer was invaginated in the stomach by a double row of seromuscular sutures. The patient made a prompt recovery, but a year later had another hemorrhage of severe character. At operation the pyloric third of the stomach was found involved in extensive ulceration. Gastrojejunostomy was therefore performed. Up to the time of report, one year later, the patient was

in good health. This case is of the greatest interest as showing that ligation of the vessels and invagination of the ulcer did not arrest the ulceration.

Beach reports a remarkable case of hemorrhage from the whole gastric mucosa. When the stomach was opened and cleared of clots it was seen that the blood oozed from a large part of its inner lining as it might from a granulating surface. It was easily stopped by pressure, but as soon as the pressure was removed the oozing began again. The stomach was therefore stitched in the abdominal wound and its cavity packed with gauze. This gauze was removed in forty-eight hours without difficulty. On the following day, for a slight gastric hemorrhage, other gauze was introduced. There was no further hemorrhage up to the morning of the eighth day, when death occurred in spite of the fact that fluid nourishment was administered through a rubber tube into the duodenum in addition to regular rectal enemata. Beach was of the opinion that could the patient's strength have been maintained until the interior of the stomach regained its normal condition the organ might have been separated from the abdominal wall and the opening in it sutured. The gauze packing seemed to control the hemorrhage nicely and did not cause excessive pain or vomiting.

A NEW INTESTINAL BUTTON. Kelling,¹ in a paper on "Protheses in Stomach and Intestinal Unions," recapitulates the various disadvantages that have been claimed to exist in the Murphy button. He thinks, however, that many of them are ascribable to imperfect technique.

Kelling has used the button to his entire satisfaction in twenty-four selected cases within the last two years, always carefully examining it as to its technique. For safety's sake he always placed seroseros sutures over the button.

The disadvantages of Murphy's button consist in its weight, its size, and its non-resorbability. He therefore devised a button free from the latter's objectionable features and yet embodying the advantages of Murphy's button—that is, a button that remains attached to the anastomosis until the constricted necrotic wall of the intestine has been pushed off, but which, after it has come loose, is promptly digested in the stomach or intestine. His button consists of a decalcified ivory cylinder, widening into a funnel at either end. The entire button is covered with rubber excepting the deep incision on the outside of it, into which the intestinal wall is tied by means of a purse-string suture. By tying the intestinal wall over this portion it is closed water-tight against the digestive juices. An elastic ring is stretched around the

¹ Arch. f. klin. Chir., 1900, vol. lxii., No. 4.

outer groove at the wider funnel-shaped opening, and, together with the button, is inserted into the lumen of the stomach or intestine. After the button is fastened by two purse-string sutures the elastic ring, which can be easily felt through the wall of the intestine, is pressed out of the groove and pushed toward the incision in the button. The tendency of the ring being to contract, it will try to slide inward along the inclined surface of the funnel, and thus press the walls of both ligated sections of the intestine against the opposite projecting border of the button.

After the necrosis of the intestinal wall has been accomplished the ring is drawn into the incision in the button, but as it does not completely fill the same the digestive juice has access, and after dissolving the necrosed wall of the intestine it dissolves the button.

His experiments upon dogs have been entirely satisfactory ; he has observed no disadvantages, but evident advantages in his methods as compared to those now in vogue. He therefore holds that a trial upon the human subject is justified.

COVERING OF DEFECTS OF THE STOMACH BY MEANS OF THE TRANSPLANTED OMENTUM. Enderlen,¹ in a recent paper, gives a very interesting account of his experiments upon cats and dogs. While the latter recovered from the operation without any symptoms of disease, the former suffered more or less intensely. The animals were not allowed any food during the twenty-four hours preceding the operation. He then proceeded as follows :

1. Pulling forth of the stomach and union of the same with the omentum by seroserous suture in the neighborhood of the greater curvature.

2. Incision of the stomach and excision of a portion of the wall of the same, 1 qcm. in cats and from 2 qcm. to the size of a fifty-cent piece in dogs. The mucous membrane was excised so far that the wound of the mucosa was on a level with the serosa of the stomach ; then the second suture of the serous membrane of the omentum is placed in the border of the wound.

3. Closure of the defect by two rows of sutures.

4. Fastening of a further segment of omentum over the whole by means of three or four silk sutures. (This was particularly necessary in cats with a thin omentum which was easily torn during suturing.)

5. Abdominal suture.

After transplantation of the omentum the animals were left without food for twenty-four hours, after which milk was given in gradually increasing quantities until finally the normal food was given again.

¹ Deutsche Zeitschr. f. Chir., April, 1900, vol. lv.

The conclusions Enderlen draws from his experiments are as follows :

1. Closure of defects in the wall of the stomach by means of transplantation of the omentum is possible.
2. The experimentally created defect becomes smaller in size owing to the contraction of the stomach and owing to the shrinkage of the transplanted portion of omentum.
3. The transplanted omentum becomes epithelialized. The epithelium is high cylinder epithelium.
4. After six weeks the formation of tubes may be noticed ; the latter are of different width and are generally convoluted.
5. Chief and oxyntic cells are still missing sixty-eight days after operation.

Complication of Gastrojejunostomy. Brown tells of an interesting complication which arose during convalescence from a gastrojejunostomy performed to relieve pyloric obstruction due to cancer. Senn's plates were used. All went well for two weeks ; at the end of that time symptoms of obstruction reappeared, with severe pain and regular vomiting, corresponding with the quantity of fluids taken. It was evident that the new opening was obstructed. The abdomen was reopened and the anastomosis examined, which appeared perfect. An incision was therefore made into the stomach two inches above it and the finger inserted into the cavity of the stomach. The bone-plate in the stomach had disappeared. The opening from the stomach to the bowel was completely shut off by a thin membrane which was readily torn through by the finger. The patient made a satisfactory recovery. The operator said that the membrane was about as thick as ordinary note-paper and that he was unable to suggest what occasioned its formation.

Gastric Perforation. Eve mentions a case of gastric perforation in the posterior surface of the stomach which illustrates the ill effects of administering morphine under such circumstances. Four hours after the typical attack came on a quarter of a grain of acetate of morphine was injected hypodermatically. Four hours later a marvellous change had occurred in her condition : the pain had quite disappeared, the legs were extended, and the rigidity of the abdominal muscles had to a very great extent subsided. With the exception of some coldness of the nasal tip all the symptoms of collapse had passed away ; in fact, so far had the patient recovered that she expressed herself as being perfectly comfortable. But the temperature had risen to 102° F., and manipulation of the abdomen could be carried out without giving rise to pain. This improvement might easily have led to fatal delay had the surgeon yielded to the solicitations of the friends and postponed operation until the following day. He operated the same evening, found the opening

in the posterior surface near the cardiac orifice, sutured it without difficulty, and the patient recovered.

Dilatation of the Stomach. Bennett says there are three stages of gastric dilatation. The first stage is one of irritation due to the resistance met with when the food attempts to escape. The second stage is one of comparative tolerance, the stomach having accustomed itself to the long retention of masses of food. The patient usually has a distaste for food and suffers more or less pain until vomiting relieves the stomach. The third stage is that of advanced dilatation with recurrent irritability, the result of fermentation of the stomach contents, which produces periodic vomiting of sour, offensive material in great quantities. It cannot be too strongly emphasized that surgical treatment, to effect the greatest benefit, should be undertaken before the dilatation has been followed by organic changes in the walls of the organ, which may have so impaired its functional power as to make a return to a normal condition impossible, even though the cause of dilatation should be entirely removed.

If an exploratory laparotomy reveals a growth it must be removed or not as circumstances indicate. Should there be pyloric thickening, pyloroplasty is probably the best measure to adopt. Adhesions of the stomach to the surrounding parts must of course be divided.

Bennett further says that in a considerable percentage of cases of gastric dilatation in which exploratory abdominal section has been performed no evidence of obstruction of any kind can be made out by manipulating the organ from its external surface, yet in many of these pyloric obstruction, sometimes to an extreme degree, exists and is remediable. In all cases, therefore, after abdominal section for dilatation of the stomach the viscus should be opened on the cardiac side of the pylorus, even if a previous manipulation has failed to detect any sign of thickening or other abnormality, in order that the condition of the pyloric sphincter may be examined.

If upon examination in this manner any contraction of the lumen of the pylorus is found the sphincter should be forcibly stretched until it will allow two or three fingers to lie loosely in it. Such a measure is curative in the true sense, but it should be adopted not as a last resource, but before the stomach walls have undergone degenerative changes which may render their return to a healthy state impossible.

Musser and Steele give the following points, which they say are the most valuable in establishing a diagnosis of motor insufficiency :

1. The presence of undigested food and fluid in the stomach fasting overnight.

2. The manner of inflow and outflow of water when the stomach-tube is used is characteristic. In enlargement of the stomach due to

obstruction of the pylorus, water flows in slowly and flows out with great readiness. This is due to the hypertrophy of the muscle wall of the stomach caused by its efforts to overcome an obstruction at the pylorus. On the other hand, if the walls of the stomach are relaxed from inherent weakness, then water flows in readily, the contents cannot be expressed, and it is difficult to empty the stomach entirely by siphonage.

3. Inspection of the abdomen is a sign of negative value in cases of dilatation from atony.

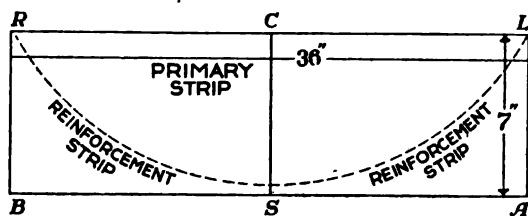
4. While peristaltic waves are often seen in cases of dilatation due to pyloric obstruction, they are not usually observed in atonic dilatation.

5. There is always evidence of fermentative process in the stomach.

6. The urine is always scanty and concentrated, owing to the fact that water is not absorbed by the stomach wall.

GASTROPTOSIS. Lincoln has devised a support for use in gastroptosis which, being made of plaster, becomes when applied to the patient to

FIG. 47.

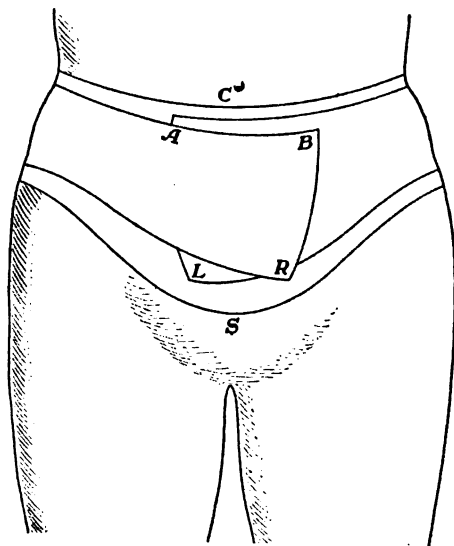


all intents and purposes a part of his skin, and cannot therefore be displaced. It consists, as shown in Fig. 47, of a piece of ordinary rubber-plaster, thirty-six inches long and either twelve or seven inches wide, according to the size of the individual. It is cut following the dotted line L. S. R. The pieces L. S. A. and R. S. B. serve as reinforcement pieces, to be spoken of later. Having the body stripped from the level of the umbilicus to the hips, and with a third person to assist if possible, apply point S. in the median line one or two inches above the symphysis. The line S. C. should lie directly over the median line of the abdomen. Having your assistant support the patient on the right side, apply the plaster included by C. S. L.; then with the support at the left, apply in like manner C. S. R. Draw as taut as possible during application. The two ends of this plaster will overlap at the back of the patient. As to the reinforcement pieces, which in reality are the most essential of this mechanical device, apply L. an inch or so to the right of S., running the edge L. A. vertically up over the already applied plaster. Pull with great force toward the patient's left as

L. S. A. is adjusted ; apply the third piece to the right side in like manner. These two pieces will meet or overlap at the patient's back. Trim the edges in the regions of the hips and umbilicus, if necessary (Fig. 48). The lower abdomen is now firmly and comfortably supported, and many patients will at once express relief, more particularly those complaining of pain in the back, dragging sensations, nausea, vertigo, etc.

Lincoln has used this support in eighty cases, with eminent satisfaction.

FIG. 48.



Perforating Duodenal Ulcers. Weir says that ulcers of the duodenum perforate less frequently than those of the stomach and that their diagnosis is even more difficult. He groups records of 51 cases from his own note-book and from the literature, in all of which operation was attempted. The usual symptoms of perforation are as follows : Great pain at the epigastrium or to the right of this region was noted 26 times in 47 cases. It has a few times been observed at the umbilicus and in the left side, but in 23 others of the 47 instances it was simply recorded as abdominal pain. Vomiting often follows the attack of pain. It occurred in 28 out of 34 instances. Shock is not often met with, but may be severe and fatal. Peritoneal symptoms rapidly develop, with a tendency in some cases to be localized in the upper part of the abdominal cavity and in the right side. When these signs show themselves mostly to the right and at or below the level of the umbilicus an appendicitis is necessarily simulated. When the liver

dulness has been dissipated up nearly to the mammary line air extravasation may be suspected, and when accepted as present it will aid in concentrating the diagnosis. This symptom of liver resonance, unless marked, is so often found to be due to a distended colon that it should not be much relied on.

The tables of cases operated upon for gastric perforation clearly show that the mortality is dependent to a large degree upon the number of hours that elapse between perforation and operation. In duodenal perforation the same outcome is observable. In the 51 cases of duodenal perforation presented by Weir there were 25 cases in which the lesion was recognized and closed at the operation; in 13 of these operation was performed after thirty hours' delay, and resulted fatally; 12 patients were operated on within that time, and 8 survived, giving thus only 33½ per cent. of mortality.

Prior to 1895, in the 28 cases reported up to that time in which laparotomy was done for duodenal perforation, in 15, or 75 per cent., the ulcer was not found; in 5, or 25 per cent., it was found and sutured. In only 2 cases, or 10 per cent., was the possibility of a duodenal perforation considered. Contrast this with the 32 cases of operation since 1895, when the analogous surgery of gastric ulcer began to be developed. In only 11 per cent. of these 31 cases was the perforation found. It was found and sutured in 20 cases, or 65 per cent. Its presence was considered in diagnosis in 11 cases, or 35 per cent.

Marocco says that duodenal ulcer is generally met with in the first portion of the duodenum, from 3 to 8 cm. beyond the pylorus, but it may be found in the second or third portion, and then frequently in conjunction with the ulceration of the first portion. The ulcer is circular or elliptical and situated in the longitudinal axis of the bowel. It is cone-shaped, with the apex toward the peritoneum. It is more liable to perforate than gastric ulcer. Men are seven or eight times more liable than women. There is no special predilection as to age. As in gastric ulcer, probably no one theory of etiology contains the whole truth. The disease is chronic, lasting eight to ten years or more. It may be purely latent as regards symptoms, or show itself as indigestion merely, or be accompanied by specific pain. The presence of pain in the right superior quadrant of the abdomen, radiating to the shoulder and tenth and twelfth dorsal vertebræ, coming on two or three hours after food, and with occasional vomit containing small quantities of bile, with undigested muscle tissue in the feces, suggests duodenal rather than gastric ulcer. Melæna is more common than hæmatemesis. If prolonged trial of medical treatment is not successful, and the patient is wasting, gastro-enterostomy should be performed.

SURGERY OF THE LIVER.

Surgical literature of the past year has been rich in articles upon the liver, interest in this organ and its diseases having been greatly stimulated by the brilliant work of Kehr, so fully reported in previous volumes of *PROGRESSIVE MEDICINE*. Three points have claimed the especial attention of physicians and surgeons alike—viz., the etiology of gallstones, the early diagnosis of gallstones, and the question of operative or non-operative treatment of gallstones.

Etiology of Gallstones. While research has not as yet definitely established the etiology of biliary calculi, the opinion is clearly gaining ground that bacteria are in some way or other responsible for their formation. The duodenum always contains bacteria, which, according to some observers, often make their way into the common duct without disturbing the health of the individual. Under certain circumstances, the exact nature of which is not yet agreed upon, the bacteria press further up the biliary passages, or possibly the lymphatics, and give rise to sufficient inflammation to cause the precipitation of solid matter in the bile and thus lead to the formation of calculi.

Shattuck gives the following points in connection with the etiology of gallstones as those upon which we have positive knowledge: The stones are composed mainly of cholesterin. Bacteria are very common and may form the nucleus of the stone. The nucleus may also be formed of bilirubin calcium or a foreign body. Cholesterin is normally held in solution by the bile. Stasis, catarrh, and a change in the reaction of the bile lead to its precipitation. Gallstones are rare under thirty, are about equally common in each decade from thirty to sixty, and are much more frequent after sixty. They are three or four times as common in females as in males. This may be due to the sedentary life of women, to clothing which impedes respiratory motion, and to pregnancies, with resulting relaxation of the abdominal walls. Gallstones are said to be common in the insane and in the subjects of chronic heart disease. In both instances an inactive life may explain the frequency.

Modern bacteriology throws much light on the origin of catarrh of the gall-bladder. The conclusions which seem to be justified by the careful study of the literature up to date are as follows:

1. A sterile foreign body does not lead to gallstone formation, though a sterilized gallstone may be penetrated by at least the colon bacillus.

2. The contents of the hepatic and cystic ducts and also of the gall-bladder are usually sterile.

3. The common duct not infrequently contains bacteria, a fact readily explicable by the relation of the duct to the intestines.

BREWER'S DIAGNOSIS CHART IN DISEASES

Pathological condition.	Pain.	Fever.	Vomiting	Jaundice.	Tumor of gall-bladder.
I. CALCULOUS DISEASES.					
(a) Stone in healthy gall-bladder, ducts free.	No.	No.	No.	No.	May be present from large number or size of stones.
(b) Stone in healthy gall-bladder, cystic duct temporarily obstructed.	May be absent; generally present during obstruction; paroxysmal.	No.	May be present when colic occurs.	No.	May be present from distention.
(c) Stone impacted in cystic duct.	No.	No.	No.	No.	Present; may attain large size.
(d) Stone in hepatic duct.	Frequently present; irregular type.	Occasionally present.	May be present during pain.	Frequent	No.
(e) Stone in common duct; acute obstruction.	Present; acute paroxysmal radiating to back.	Generally present.	Present.	Present.	No.
(f) Stone in common duct; movable; chronic.	Periodic attacks of acute radiating pain.	Present with chills and sweats.	Present.	Present; intermittent.	Rarely present
(g) Stone in common duct; impacted; chronic.	May be absent; frequently present early; may be intermittent; variable.	May be present; variable.	Often present.	Present; progressive; may vary in intensity.	Rarely present
II. INFLAMMATORY DISEASE.					
(a) Cholecystitis sub-acute.	Present; paroxysmal during periods of cystic duct closure from stone or swollen mucous membrane.	Present during attacks of colic.	May be present	No.	Present during attacks of cystic duct obstruction.
(b) Cholecystitis acute.	Acute paroxysmal radiating pain; extending to back and shoulder; may be very severe.	Present, with chills and sweats.	Present; often severe.	No.	Present; tenderness; often muscular rigidity.
(c) Cholecystitis chronic (empyema of gall-bladder).	Severe radiating pain at first; may disappear later; tendency to recur.	Present; severe at first, may diminish later.	Present at first.	No.	Present; with tenderness; may attain large size.
(d) Cholecystitis in previously diseased and contracted gall-bladder.	Present; often severe; paroxysmal.	Present; often with chills and sweats.	Present.	No.	No (occasionally present, due to pericystic exudate).
(e) Cholangitis of hepatic and common ducts.	May be absent; generally present when obstruction exists, or severe infection; tenderness and pain over liver in intrahepatic cholangitis.	Present; chills; sweats; severe prostration; general sepsis.	Present.	Present; variable.	No.
III. NEW GROWTHS.					
(a) Carcinoma of gall-bladder.	No; may occur late in disease.	No.	No.	Present late (portal glands).	Hard, irregular, movable tumor at first, later diffuse infiltration. Present when obstruction exists.
(b) Tumor of cystic duct.	No; may occur late.	No.	No.	No.	Present when obstruction exists.
(c) Tumor of hepatic or common duct.	No; may occur late.	No.	No.	Present; progressive.	May be present from distention with bile.
(d) Tumor of neighboring viscera producing chronic obstruction of common duct.	No; may occur late.	No.	No.	Present; progressive; may become extreme.	Present; generally from distention with bile.

OF THE GALL-BLADDER AND DUCTS.

Urine.	Stools.	Liver.	Spleen.	Ascites.	Remarks.
Negative.	Normal.	Not enlarged.	Not enlarged.	No.	Generally discovered by accident; often unrecognized.
Negative.	Normal.	Not enlarged.	Not enlarged.	No.	All symptoms promptly relieved as soon as obstruction removed.
Negative.	Normal.	Not enlarged.	Not enlarged.	No.	Hydrops of gall-bladder often unrecognized.
Contains bile pigment at times.	May be clay colored if obstruction occurs.	Frequently enlarged.	Not enlarged.	No.	Diagnosis extremely difficult; symptoms generally due to co-existing cholangitis.
Contains bile pigment.	Clay colored.	Not enlarged.	Not enlarged.	No.	Symptoms rapidly disappear when stone passes papilla.
Contains bile pigment.	Clay colored.	May be enlarged during attack.	May be enlarged from pressure of stone on vein.	No.	" <i>Fièvre intermittente hépatique</i> " of Charcot resembles malaria; all symptoms disappear during interval.
Contains bile pigment.	Clay colored.	Enlarged.	May be enlarged.	No.	Condition may remain for many years; may only be jaundice with digestive disturbances and loss of weight; history of previous attacks (?) Ascites may be present from pressure of large stone or possibly from hydrops.
Negative.	Normal.	Not enlarged.	Not enlarged.	No.	Tenderness over gall-bladder; tendency to recurrence; generally associated with stones in gall-bladder.
May contain albumin and casts.	Normal.	Not enlarged.	May be enlarged (sepsis).	No.	May follow typhoid or other septic diseases; onset often sudden; rapid development of severe symptoms resembling appendicitis; may be necrosis of walls of gall-bladder with perforation, local or general peritonitis.
Negative.	Normal.	Not enlarged.	Not enlarged.	No.	Frequently follows acute cholecystitis; occasionally becomes quiescent, presenting practically no symptoms.
Negative.	Normal.	Not enlarged.	May be enlarged (sepsis).	No.	Generally tenderness over gall-bladder area, but no tumor; local peritonitis; diagnosis often extremely difficult.
May contain bile pigment, albumin, and casts.	May be clay colored.	Enlarged.	Enlarged (sepsis).	No.	Often follows severe infections of gall-bladder; generally associated with stones in common or hepatic ducts; severe sepsis; generally fatal in virulent infections (streptococcus).
Negative (at first).	May be clay colored late.	Enlarged late in disease.	May be enlarged late (pressure on vein).	Present late.	Digestive disturbances, progressive loss of weight and asthenia; cachexia; rapidly fatal.
Negative.	Normal.	Not enlarged.	Not enlarged.	No. (?)	Very rare; both benign and malignant growths have been reported; diagnosis difficult.
Contains bile pigment.	Clay colored.	May be enlarged.	Not enlarged.	May be present late.	Very rare; diagnosis difficult.
Contains bile pigment.	Clay colored.	Enlarged.	May be enlarged late.	Present late.	Malignant tumors most common; chronic interstitial pancreatitis from previous infection of biliary passages may remain after cause has disappeared; enlarged portal glands; Hodgkin's disease.

4. Gallstones have been produced experimentally by a number of observers with a number of organisms. Mignot failed with virulent cultures, while he succeeded with attenuated cultures alone or in connection with a foreign body.

5. The presence of bacteria has been demonstrated in connection with a considerable proportion of cases of gallstones.

6. The clumping of the typhoid bacillus led Richardson to think this peculiarity might play an important rôle, and he produced gallstones in a rabbit by the introduction of a small amount of a clumped bouillon-culture into the gall-bladder.

7. The colon bacillus and the typhoid bacillus are the most common bacterial agents in gallstone formation.

Thus it would seem that stasis of the bile is a very important factor. This, once established, permits a change in the reaction of the bile contained in the gall-bladder, favors a precipitation of bilirubin calcium, increases cell-desquamation from the gall-bladder wall, and affords a nidus for the growth of bacteria possibly derived from the blood, probably usually from the common duct and intestines. The broad therapeutic deductions are, hence, to forestall in all ways in our power causes of stasis and to annihilate typhoid fever. The combat is with fashion and disease, and the former is less hopeful.

Diagnosis of Gallstones. While the diagnosis of gallstones and the determination of the location of the stone is often such a difficult matter that it cannot be settled by any rule of thumb, yet a careful sifting of the symptoms and weighing of their individual values will usually enable the clinician to form a probable diagnosis. Kehr made the start in the right direction by classifying the varieties of surgical hepatic trouble and setting down the symptoms associated with each, as far as his wide personal observation went. This work has been extended by others, and a table arranged by Brewer (see pp. 134 and 135) is especially useful, though it cannot be claimed for it that it is a perfect guide to a solution of every case for diagnosis. In preparing this chart he has made use of the symptoms mentioned in the report of cases by Kehr and others. For convenience he has arranged the different pathological conditions under the three heads of calculous disease, inflammatory disease, and new-growths.

Means emphasizes the fact that gallstones never occur in the first decade of life, and rarely in the second and third decades. They occur more frequently in women than in men. The only pathognomonic symptom is the discovery of gallstones in the feces; this, unfortunately, does not occur in very many cases. A summary of the symptoms shows a paucity of characteristic ones. However, with the presence of gastric disturbances, paroxysmal pains in the region of the

gall-bladder, tenderness in the right hypochondrium, jaundice with pruritus, ashy-colored stools, highly colored urine containing bile pigments, enlargement of the liver, and all of these symptoms occurring in a patient beyond thirty and of sedentary habits, a diagnosis of cholelithiasis can be made with a great deal of certainty.

McGrew thus contrasts the symptoms of obstruction of the cystic duct and of the common duct :

SYMPTOMS OF CYSTIC DUCT AND COMMON DUCT OBSTRUCTION CONTRASTED.

Cystic Duct Syndrome.

a. Attacks of gallstone colic, exhibited by pain, rigor, vomiting, rise in temperature, symptoms of collapse—the pain being excruciating and referred to the right hypochondriac and umbilical or epigastric regions.

b. If the gallstone impaction is permanent :

Tenderness in the right hypogastrium on pressure.

Soreness and dragging pain in the right side.

Retention cyst (dropsy) of the gall bladder, causing a slowly increasing distention of the organ, which may reach enormous size, filling the right side of the abdominal cavity.

c. If the gallstone impaction is temporary :

The offending body may slip back into the gall-cyst, and only a slight hypogastric tenderness mark the presence of gallstones until another attack of colic occurs. Ordinarily, dyspeptic disturbances and fleeting attacks of gall-cyst tenderness mark the interval between attacks. Occasionally a bladder filled with gallstones may be palpated below the border of the liver, and the stones thus detected, or grating sounds may be auscultated.

The offending body may pass onward into the common duct, when its history belongs in the opposite column

Common Duct Syndrome.

a. Attacks of gallstone colic, paralleling the contrasted condition, except that the pain is referred to the right hypochondriac and right subscapular or right shoulder regions.

b. If the gallstone impaction is permanent :

Tenderness and discomfort in the right hypogastrium.

Jaundice.

Bile in the urine.

Absence of bile in the stools.

Stools fatty, white, offensive.

Constipation.

Enlargement of the liver.

Slight distention of the gall-bladder.

Pulse slowed to 60, 50, or even 40.

Nervous symptoms of cholæmia.

c. If the gallstone impaction is temporary :

The offending body passes onward into the duodenum and may be washed from the stools. It leaves a lingering tenderness in the hypogastrium. The liver shows temporary enlargement ; there may be temporary jaundice, and distention of the gall-bladder. Constipation is common, and the stools and urine show more or less change, temporary in character. The symptoms due to the stones remaining behind are similar to those of the opposite condition.

The symptoms of obstruction of the common bile-duct vary, Deaver says, according to the character and cause of the obstruction. Acute obstruction gives a sudden attack of colic with nausea and vomiting, pain, tenderness, and in some instances collapse. The colic is due to

the efforts of the duct to expel the foreign body. It is therefore analogous to the colic of appendicitis. The colic may cease when the stone has been forced into the duodenum, or when it drops back into a pouch in the duct, as the ball in a ball-valve. Beside the pain in the liver there may be agonizing pain radiating to the right shoulder or referred to the epigastrium or umbilicus. Tenderness is evident even upon slight palpation, and if cholecystitis exists the slightest touch is painful. The rigidity of the right rectus muscle is an early symptom, while rigidity of the other muscles in the right upper quadrant of the abdomen occurs later. There is an increase of temperature at the onset of the inflammatory stage. If the obstruction is of short duration jaundice will be absent. Nausea, vomiting, and collapse are of reflex origin. The last-named symptom may presage rupture of the duct.

Permanent obstruction, whether from the presence of a stone or malignant disease, is always accompanied by jaundice. If due to malignancy the jaundice will be progressive. An irregular, interrupted temperature is pathognomonic of the presence of gallstones. Malignant disease which leads to obstruction of the duct usually starts in the head of the pancreas. The symptoms in such cases are digestive disturbances, progressive loss of weight and strength, constant pain, the absence of characteristic colic, and the presence of a tumor in the epigastric region, without elevation of temperature.

Gallstones and Appendicitis. The difficulty of making a differential diagnosis between gallstones and appendicitis has been referred to by several writers. Ochsner comes to the conclusion, from a series of operations performed by himself, that in 33½ per cent. of all gallstone cases appendicitis is coexistent, while perhaps 10 per cent. of the patients who suffer from appendicitis have gallstones. These percentages are sufficiently great to make it desirable to examine the appendix during an operation for gallstones and vice versa. He recommends in doubtful cases an incision through the right rectus abdominis muscle, which can be extended either upward or downward according to the necessities of the case, so as to permit the operator to reach either the gall-bladder or the appendix.

OPERATIVE TREATMENT OF GALLSTONES. Richardson takes up the analogy between an attack of appendicitis and an attack of biliary colic. For him this analogy leads at once to the practical question, What are the indications for operation in the presence of gallstones? The only rational answer, in his opinion, is an exploration as soon as the diagnosis is established. The steps in his reasoning are worth careful study.

Richardson says that the analogy between the appendix and gall-bladder is in many ways striking, but is not perfect. The acute infec-

tions of the gall-bladder, for instance, result in changes in the bile, distention of the gall-bladder walls, infection of these walls, and a pericholecystitis. The distensibility of these walls, however, prevents, except in rarest instances, gangrene and perforation. Infections of the gall-bladder concern its contents more than its walls. Sterile bile becomes a culture-medium of micro-organisms, which later involve the gall-bladder walls themselves. In appendicitis the contents, always septic, must invade the walls of the appendix to produce any lesion whatsoever other than distention with septic fluids. Moreover, infections of the gall-bladder walls do not often cause gangrene, necrosis being rather the result of pressure from overdistention than from an infectious thrombophlebitis. In the occasional gangrene of thickened gall-bladders it is not improbable that necrosis is caused directly by infection of the thickened and poorly nourished wall, with thrombosis of its vessels and hæmostasis. In such cases the course is not unlike that of the thickened appendix, the gangrenous process being quite as rapid and as fatal. The situation of the gall-bladder, even when infected and inflamed, is one of comparative isolation. The isolation makes general peritoneal infections difficult, for they rarely take place unless the gall-bladder wall gives way entirely and the abdomen is flooded with septic bile. Infections of the appendix rarely cause remote changes—tuberculosis and carcinoma. Gall-bladder lesions, on the contrary, frequently cause cancer.

Although this analogy between the gall-bladder and the appendix is imperfect as to anatomical structure, capacity, and situation, it is very close as to operative dangers and favorable results. The neglected gall-bladder endangers life quite as surely, though not as rapidly, as the neglected appendix. Its immediate course may be less fulminating, but the agony is more prolonged and the sum total of suffering is greater. The danger of removing gallstones by modern methods in the hands of skilful surgeons is exceeded by the danger of the passage of a single stone from the gall-bladder to the duodenum, just as it may truly be said that the danger of a single attack of acute appendicitis vastly exceeds that of the intercurrent operation. Hence gallstones should be removed from the bladder as soon as their presence is reasonably certain unless the diseased condition of the other viscera makes the hazard of the operation greater than the hazard of the gallstones themselves. The strongest arguments in favor of operation are the pathological changes, immediate and remote, wrought by the gallstones themselves. The surgeon sees gall-bladders in every state of contraction and dilatation; with adhesions recent and easily separated, or old, cartilaginous, and inseparable; containing bile varying from normal to purulent and even to putrid; with a single gallstone or with several hundred; in not a

few instances malignancy beginning or fully developed. The cystic duct will often be found plugged by a stone, causing dilatation of the gall-bladder. The surgeon may find an acute cholecystitis, and dilatation even to bursting with purulent secretions; impacted gallstones in the common duct, with enlarged liver and jaundice; cholæmia and its serious manifestations. In not a few cases the most fatal complications will have arisen before the surgeon has had a chance to attempt relief—rupture of the gall-bladder and general peritonitis, purpura, hemorrhage, exhaustion, and those other and rarer complications by which the history of gallstones is ended. On the other hand, the family physician sees, it must be admitted, not a few patients who after one or two attacks of gallstones remain permanently well and in whom none of these immediate or remote pathological changes are ever noted. Furthermore, the pathologist will often find the gall-bladder distended with gallstones which have never given the least sign of their presence. However, an early operation carries with it only a slight risk and promises an almost certain success. The removal of gallstones from a normal gall-bladder, in the experience of Richardson as of many others, has been without mortality. The proportion of such cases is not as large as it should be, for few patients come for operation until they have been forced to it by years of repeated attacks of colic or by the unbearable suffering of a permanent jaundice.

What are the indications, then, for operation on gallstones? In Richardson's opinion, "the indication is the diagnosis of gallstones in the gall-bladder. When this diagnosis has been made the gall-bladder should be explored if there is no contraindication in other viscera. A single attack of gallstone colic after which a faceted stone is found in the stools indicates operation, but a single attack after which a single non-faceted stone is found does not. Repeated attacks of severe colic, even if stones are not found in the stools, strongly indicate exploration, especially if there is tenderness in the gall-bladder, with fever; for stones are probably confined in the gall-bladder or at its outlet, and the spasms are ineffectual efforts of the gall-bladder to expel them. All cases of acute cholecystitis demand operation if seen early, unless the symptoms are rapidly improving, and then they require operation after the subsidence of the acute attack. Repeated attacks of gallstone colic indicate operation even if no stones are discovered in the stools and even if the symptoms are so mild as not to demand it.

"True conservatism in surgery of the gall-bladder—the lesions of which are purely mechanical—requires, as the only rational treatment, surgical measures which themselves are purely mechanical. Though natural relief in gallstones is not as impossible as in stones of the urinary bladder, the former because of their occurrence cause far more

suffering and death than do the latter. Furthermore, the complications of gallstones are in many instances quite as disabling as those of urinary calculi, and they often are more rapidly fatal.

"A most pernicious argument against operative measures in gallstone affections, as in appendicitis, is the occasional quiescence, and the occasional complete recovery after severe symptoms; but in neither lesion can any man predict the probable course. Removal of the appendix that has offended or is offending is the only common-sense method of treatment, as most experienced operators and clinicians will admit, the chief difference of opinion being as to the safest time for the operation. So in patients who have suffered from gallstones—who are suffering from them—it is but common-sense to advise simple and safe methods of sure removal, rather than the uncertain and dangerous courses of natural evolution. In both diseases early operation cannot but be regarded, in the light of experience and of common-sense, as a life-saving procedure gained at a minimum of risk."

NON-OPERATIVE TREATMENT OF GALLSTONES. While the views expressed by Richardson are doubtless indorsed by most surgeons, physicians are not as ready to advise operation as soon as a diagnosis of gallstones has been made. For example, take the remarks made by Janeway and Kinnicutt in discussing a long-standing case of obstructive jaundice—fatal, it is true, and without operation.

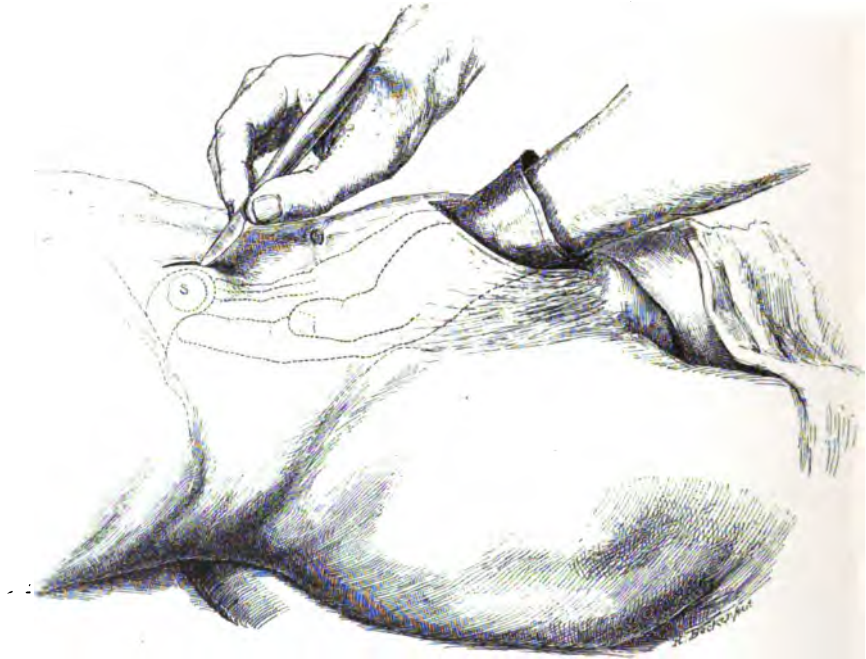
Janeway said he thought it was not advisable to operate under such circumstances on account of the danger of hemorrhage incident to the long duration of the jaundice. This patient died about a year after Janeway first saw her. The post-mortem examination showed a stone in the common duct, while the duct was surrounded by inflammatory adhesions. Janeway said that no general rule could be given as to the length of duration of jaundice which would make an operation inadvisable. In cancer of the common duct with obstruction a fatal hemorrhage may follow an operation performed only four or five months after the jaundice appears. He said he had seen six fatal cases of this kind, each one operated upon by a different surgeon. In obstruction due to stone, it is, perhaps, safe to operate if the jaundice has existed less than two years.

Kinnicutt usually advises against operation in the presence of cholæmia on account of the danger of fatal hemorrhage. In the past few years he has seen several cases in which a fatal issue followed operation, although the cholæmia was of moderate degree.

OPERATIONS FOR GALLSTONES. Kelly makes a practice of examining the important viscera whenever the abdomen has been opened wide enough to permit the introduction of the hand, and provided, of course, the condition of the patient permits of this slight delay. He

has several times found a gallstone and removed it in the following manner: The left hand is introduced and followed up the anterior abdominal wall to the liver. The notch in the edge of the liver directs the fingers to the gall-bladder. A light pressure upon this viscus partially empties it of bile if the cystic duct is patent. If a stone is present it is pressed up to the top of the gall-bladder, and then pressed against the anterior abdominal wall. The knife, held in the right hand, cuts down upon it through a very short incision, four to five centimetres in

FIG. 49.



The left hand, covered with a glove, is introduced through the incision above the symphysis; the gall-bladder is found and the stone pushed up into the fundus and against the abdominal wall, where it makes a decided prominence. The free hand is next engaged in liberating the stone by cutting directly down through the tissues of the wall until the bladder is opened and the stone escapes. (KELLY.)

length. When the stone has been evacuated the edges of the wound in the gall-bladder are stitched together, and this first row of sutures is buried by a second one placed in the peritoneal coat of the gall-bladder. The bladder is then dropped. If it shows evidence of disease, a drain is introduced leading up to it. Fig. 49 shows clearly the facility with which stones can be removed by this method.

FREQUENCY OF GALLSTONES The frequency of the occurrence of gallstones has been variously stated. The following table is from statistics collected by Schroeder, covering 1150 autopsies:

Age.	No. of autopsies.	Cases with gallstone.	Percentage of gallstone cases.
0-20	82	2	2.4
21-30	188	6	3.2
31-40	209	24	11.5
41-50	252	28	11.1
51-60	161	16	9.9
60 and over	258	25	25.2

In this series 4.4 per cent. of the males had gallstones and 20.6 per cent. of the females. A review of the record of a thousand autopsies made in the Johns Hopkins Hospital showed that gallstones were found in 5.9 per cent. of the cases, or in 4.8 per cent. of the males and 7.8 per cent. of the females. This is, perhaps, the first time that statistics of any considerable number of cases have been presented from America.

DRAINAGE. The indications for drainage of the biliary passages are stated by Sommers as follows :

1. In acute or chronic inflammations of the gall-bladder or ducts which are not amenable to medical treatment and which occur independently or as complications or sequels of infectious diseases.
2. In gallstones in the bladder or ducts producing frequent attacks of biliary colic with or without mild jaundice.
3. In palpable enlargement of the gall-bladder, especially if the constitutional and local symptoms point toward the presence of pus.
4. Whenever the history combined with the local and constitutional symptoms indicate phlegmonous or ulcerative cystitis, and more urgently still if commencing gangrene of the gall-bladder is suspected.
5. In puncture, perforation, or rupture of the gall-bladder.
6. In suppurative inflammation of the ducts of the liver.
7. In all cases symptomatically pointing toward connective tissue (stricture) or gallstone obstruction in the gall-ducts.
8. Whenever inflammatory adhesions or new-growths interfere with the normal outflow of bile into the duodenum.
9. In addition it might be mentioned that, as it is sometimes impracticable to drain infected or obstructed bile-ducts externally, methods are available by which continuous drainage may be established into the intestinal tract.

CHOLECYSTECTOMY. Gibson believes that cholecystectomy as a means of treating cholecystitis and cholelithiasis is called for under the following conditions : In all cases of cholecystitis with or without stones, acute or chronic, provided that the gall-bladder and gall-ducts can be properly explored, and that the conditions promise an easy removal of the gall-bladder, and provided that the common and cystic ducts (sometimes also the hepatic) are demonstrated to be free from stone, and that in addition to stone there is no other obstruction of the lumen of the common duct such as a tumor, benign or malignant, of

the pancreas. The operation is also recommended even when its performance is difficult or possibly entails a slightly greater risk in a limited class of cases—that is, when it is the only satisfactory way to deal with the gall-bladder, and as a prophylactic measure against malignant disease in presence of long-standing irritation. If these various limitations receive a strict interpretation the number of cholecystectomies that are justified by the above indications will be comparatively restricted, and the operation will be done only under circumstances that permit of its greatest usefulness with a minimum of risk. Two of Gibson's illustrations are here reproduced (Figs. 50 and 51).

FIG. 50.



FIG. 51.



Michaux has extirpated the gall-bladder thirty-two times, losing only four patients. He looks upon cholecystectomy as the operation of choice when the bladder is thick, retracted, and contains a few stones, but does not advise this operation in suppurative catarrh of the bladder. Cholecystectomy gives better immediate and late results than cholecystostomy, and fistula from the latter operation may persist a year or more.

Mayo says that excision of the gall-bladder is clearly indicated (1) after severe traumatism, (2) if an intense inflammation or gangrene exists, (3) on account of malignant disease, and (4) for permanent obstruction of the cystic duct when the common duct is patent. In the first three conditions mentioned all coats of the gall-bladder are involved,

and complete cholecystectomy is the logical procedure. In the fourth instance the mucous membrane is alone at fault and a cure will follow its removal. He therefore advocates the enucleation of the mucous membrane of the gall-bladder, as this operation is less dangerous than complete cholecystectomy. The mucous membrane is easily detached, and even though the bladder be small and deeply placed removal of its mucous membrane is far less difficult than complete extirpation.

Distended Gall-bladder. Swain mentions a case of distended gall-bladder in which the obstruction to the cystic duct had apparently been brought about by the dragging on the gall-bladder caused by numerous adhesions to the colon. No gallstone was found. Seven ounces of a mucoid fluid, showing no trace of bile, was evacuated, and the gall-bladder was stitched to the parietal peritoneum as high in the wound as possible. The gall-bladder was drained and the fistula healed in three weeks.

Cirrhosis of the Liver. FATAL GASTRO-INTESTINAL HEMORRHAGE DUE TO CIRRHOSIS OF THE LIVER. Preble draws conclusions from some sixty cases of fatal gastro-intestinal hemorrhage due to cirrhosis of the liver. As the outcome in such cases has its weight in determining the advisability of an operation, these conclusions are valuable. They are as follows :

1. Fatal gastro-intestinal hemorrhage is an infrequent but not rare complication of cirrhosis of the liver.

2. In the great majority of cases the cirrhosis is atrophic, but it may be hypertrophic.

3. In one-third of the cases the first hemorrhage is fatal ; in the other two-thirds the hemorrhages continue at intervals over a period varying from a few months to several years, the maximum given being eleven years.

4. In one-third of the cases the diagnosis can be made at or before the time of the first hemorrhage. In the other cases the diagnosis cannot be made at all or only after months or years, during which time other symptoms of cirrhosis have developed.

5. Oesophageal varices are present in 80 per cent. of the cases and in more than one-half of these the varices show macroscopical ruptures, and it is probable that many other ruptures would be found if the varices were tested by injection of air or fluid.

6. Fatal hemorrhages occur in cases which show no oesophageal varices, and they are probably due to the simultaneous rupture of many capillaries of the gastro-intestinal mucous membrane.

7. The hemorrhages in this class of cases are usually preceded by other symptoms of cirrhosis, but the first symptom may be a fatal hemorrhage.

8. In 6 per cent. only of the cases which showed œsophageal varices was the cirrhosis typical—that is, showed ascites, enlarged spleen, and subcutaneous abdominal varices.

OPERATION TO RELIEVE PORTAL CIRCULATION. Although few attempts have been made to relieve the portal circulation in cases of hepatic cirrhosis, the relief afforded some of the patients operated upon has been so prompt and long-continued as to convince Frazier of the desirability of performing such an operation in properly selected cases. If a patient's liver is cirrhotic and there is reason to believe the liver cells are not devoid of function and internal medication, particularly if iodide of potash and paracentesis have failed to afford relief and there is no reasonable contraindication, the operation is justifiable. Such a patient is in a hopeless condition without operation, while the technique of the operative effort is so simple, the dangers are so trivial and the outlook is so promising that there seems no reasonable ground for withholding surgical relief. He himself reports a successful operation. The omentum was stitched to the parietal peritoneum of the anterior abdominal wall after the latter had been freshened by vigorous scrubbing with a gauze pad.

CARCINOMA AND CIRRHOSIS OF THE LIVER. The association of carcinoma and cirrhosis of the liver has been mentioned by several observers. It is not difficult to explain, when one remembers the presence in the liver of many structures of an epithelial character. Although primary sarcoma of the liver is so rare that some pathologists have doubted its occurrence, there are, nevertheless, several authenticated cases of sarcoma of the liver in which no starting-point for the disease could be found outside of the liver itself. Such a case was recently reported by Ford. The sarcoma occupied the right lobe of the liver and was made up of spindle and round cells. The liver itself was markedly cirrhotic, a result presumably of the alcoholic habits of the patient.

Rupture of the Liver. Delatour operated successfully upon two patients suffering from rupture of the right lobe of the liver—a result in each instance of direct violence. In both cases operation was performed about twelve hours after the injury. In both cases the abdominal cavity was still filled with fluid and clotted blood, although hemorrhage had nearly or quite ceased. In both cases the rent in the liver was in the under surface. In one case it was sutured, in the other not. Rupture of the liver is usually followed by death, some writers placing the mortality as high as 85 per cent.

That the presence of bile in the peritoneal cavity is not necessarily followed by peritonitis is shown by a case reported by Thiersch, who removed over forty pints of bile from the abdominal cavity, the patient

recovering. Naturally such a result could only follow a rupture of the biliary tract due to traumatism, for the bile must be sterile. Experiments show that a certain amount of extravasated bile may be absorbed, but as this power of absorption is necessarily limited a fatal result will sooner or later take place unless the rupture is cured by operation or spontaneously. Laffan mentions an instance in which death resulted from peritonitis five weeks after the bile was first extravasated. Such a history suggests that early interference would be likely to be followed by success. He mentions an operation performed by himself upon a woman, aged fifty years, who was trodden upon by a cow. After suffering for some time with the symptoms of acute inflammation in the abdomen she submitted to operation. She was deeply jaundiced at the time. Fortunately the inflammation had limited itself to the epigastric region. A large cavity containing bile, pus, and some fecal matter was opened, washed out, and drained, and the patient recovered.

DIAGNOSIS. In cases of inflammation of the liver the diagnosis is based upon pain in the region of the liver and in the right side, distinct difficulty in breathing, and general symptoms of an inflammatory fever.

According to Rouis, the complex of symptoms is complete in only 8 per cent. of the cases, incomplete in 79 per cent., and veiled in 13 per cent. Even experienced men sometimes do not find the abscess until after death. Palpation is a great aid in diagnosis. Percussion is the only method by which the upper borders of the liver—so significant in abscess—can be definitely outlined. The well-known classical scapulargia mentioned as a pathognomonic sign since the time of Hippocrates, although not limited to abscess, is frequently observed.

Abscess of the Liver. A symptom of hepatic abscess which has not been previously mentioned is described by Johnson, a Bombay surgeon, as “a strong hepatic odor from the patient.” The odor is difficult to detect in a well-ventilated hospital, although it can usually be demonstrated if the bedclothes are disturbed. In a small, close room it is easily detected.

SURGICAL TREATMENT. J. Smits,¹ in writing on the surgery of abscess of the liver, says that while Hippocrates already recognized surgical treatment as the only proper method of dealing with the condition, prejudice has been so strong that it is only within a comparatively few years that radical therapy has been generally accepted as most effective. During his eight years' stay in the Dutch Indies, Smits observed 22 cases of abscess of the liver; 1 of these patients was not operated upon, as the diagnosis was not made until after death, at autopsy. Of the 21 patients operated upon 18 recovered and 3 died, although

¹ Arch. f. klin. Chir., vol. lxi., No. 1, 1900.

death could not be attributed to operation. In all of the latter cases autopsy disclosed the presence of multiple abscesses which were not or could not have been diagnosticated, since only one abscess was opened during operation.

Comparing these results with those published by Sachs, it will be seen that there has been considerable improvement. Sachs reported 36 non-cases; 15 were operative; 11 patients recovered and 4 died. Of the 21 operated upon 8 recovered and 13 died. Smits believes that this improvement is due to the fact, first, that by means of improved exploratory puncture the diagnosis can be made earlier; second, that the methods and technique of operation have been greatly perfected.

The ages of the patients were as follows :

4 between	20-30 years.
9 "	30-40 "
3 "	40-50 "
1 was	60 "

In the other four cases no exact records were kept, but the ages were below forty years.

Only once was the disease observed in a woman. The majority of the patients operated upon were representatives of the Caucasian race, but neither Chinese nor Arabs, Creoles or other natives were immune.

All of the cases had passed attacks of malaria. With few exceptions all used alcohol regularly, although not to excess.

The preliminaries in the surgical treatment of abscess of the liver are : To locate the suspected pus-focus and to broadly open the same as soon as it has been found ; then the operation proper should follow in the same sitting. Any method of examination or operation that does not include these postulates is to be condemned from the start. Early diagnosis is of greatest importance to the surgeon in that it increases the chances of a good result.

The possible dangers from sepsis, hemorrhage, and injury to neighboring organs in performing exploratory puncture should be considered, although Smits states that he has done it hundreds of times without any accident. He thinks, however, that whenever the symptoms make it impossible to exclude a neoplasm exploratory laparotomy is preferable to puncture ; also when the left lobe of the liver is the seat of an abscess he prefers exploratory laparotomy.

Puncture of the abscess by means of a trocar is a method which Smits condemns as dangerous and insufficient, although it is still practised even by prominent surgeons. In proof of his view he cites the experience of Jimenez, who used this form of puncture in 297 cases, with 242 deaths, or a mortality of 82 per cent.

Accepting the view that the treatment of a pus-focus in the liver should not be treated differently from any other pus-focus, Smits states it becomes clear that in order to be efficient a method must include : (1) Broad opening of the abscess ; (2) continuous drainage until the wound is healed ; (3) protection of the abdominal cavity from the entrance of pus not only during operation but also during after-treatment.

Smits gives a detailed description of the various methods of operation used and states their advantages. Twelve of his patients were treated by the transpleural method, with 1 death ; 6 by the abdominal method, with 2 deaths ; 1 by Lannelongue's method (this patient recovered). These 19 operations were performed in two sittings. Two others—one transpleural, the other abdominal—were done in one sitting.

Laurent has invented a trocar and canula for aspiration of hepatic abscess of the liver which is here pictured (Fig. 52). He claims for it the following advantages :

FIG. 52.



Trocar and grooved canula. (LAURENT.)

1. The trocar is flat (oval on section) and therefore penetrates more readily between the ribs than the ordinary circular form.

2. The trocar is five inches long, one inch longer than the ordinary trocar. It will thus reach abscesses not accessible to the latter. Experiments upon frozen bodies show that the inferior vena cava is four and a half to five inches from the surface of a normal liver, hence the risk of wounding it with a five-inch trocar is practically *nil*. The portal vein is still more remote.

3. The grooves on either side of the canula are two valuable directors which insure safety, precision, and rapidity of operation. When the pus is very thick irrigation or aspiration can be resorted to by adapting an India-rubber tube to any canula.

Hydatid Cyst. Vagas and Cranwell,¹ of the Argentine Republic, report 943 cases of hydatid cyst observed between 1875 and 1899. With the exception of 37 cases, all the patients were operated upon in the hospitals of the single city of Buenos Ayres by experienced surgeons. Nearly all the patients were residents of the city.

For hydatid cysts of the liver the authors believe that marsupialization and drainage constitute the method of choice.

The mortality of the operation was 4.5 per cent. and 95.5 per cent. cures. The extraction of the germ-producing membrane with suture,

¹ Rev. de Chir., September 1900, No. 9.

without drainage, caused a mortality of 5.5 per cent., but the inferiority of this method is shown by the after-history of the patients. In 19.26 per cent. of the cases operated upon the immediate result was excellent, but suppuration followed, which necessitated a new opening with drainage. The cause for this late suppuration is partially explained by the bacteriological tests of Vienas, who found that the liquid contained in the cyst and also the pericystic membrane contained pathogenic germs. With marsupialization cure is certainly slower, but it is more sure. Their statistics show the mortality of multiple cysts to have been very high—42.8 per cent.

MULTIPLE ECHINOCOCCI OF THE LIVER. Könitzer¹ reports a case of multiple echinococci of the liver operated upon at the Hospital "Bethany" (Häckel, Chief), in which five cysts were found. Two of these—in the left portion of the liver—were cured by laparotomy and drainage. The other three intercommunicating cysts were in the right parenchyma; they were opened perpleurally and emptied. At the same time the contents of a subphrenic abscess were evacuated. For the purpose of securing better drainage a second perpleural counter-opening was established. Pleuritis exudativa set in, but was successfully coped with by resection of the rib and draining of the thoracic space.

The question as to the origin of these multiple cysts, he says, cannot as yet be definitely decided. He agrees with Leuckart, who says multiple echinococci, or at least the greater part of them, are probably the result of a single infection furnishing not a few only, but numerous germs.

The direct observation of an exogenously developed echinococcus produced by inoculation has been reported by Alexinsky. He found a (grand-) daughter cyst, connected with the mother cyst by a pedicle, containing vital brooding capsules and scolices.

Könitzer considers the designation "multiple echinococci" misleading when applied equally to cysts occurring in the same organ and those observed in various parts of the body. He suggests that the term *echinococcus multiplex* be adopted for multiple cysts in the same organ and *echinococcus disseminatus* for cysts occurring in two or more organs. He refers to Neisser's statistics of about 1000 cases, of which 45 are stated to be multiple, and adds that on perusing these 1000 cases he found 48 in which multiple cysts occurred in the liver alone, from which he infers that Neisser counted as multiple echinococci only such as occur in different organs. That the liver is generally involved in cases of *echinococcus disseminatus* seems evident from the statistic data

¹ *Deutsche Zeitschr. f. Chir.*, vol. lvi., Nos. 5 and 6.

of Peiper, who states that, according to Davaine, the liver echinococcus is present in 40 per cent. ; according to Neisser, in 48.5 per cent.; Fay, 47 per cent. ; while Finsen and Madelung have found the parasite present in the liver in 69 per cent. ; Thomas (Australia), in 65 per cent. According to Gerrulanos, the solitary echinococcus of the peritoneum and omentum has not yet been observed. As regards the number of cysts in one organ the subperitoneal tissues, omentum, or peritoneum surpass the liver ; it is said that they may exceed 100 in these parts.

Of 745 cases of echinococcus of the liver collected and published by various authors 94, or 12.61 per cent., were found to be multiple cysts of the liver.

That the diagnosis of echinococcus multiplex of the liver is difficult is shown by the fact that in comparatively few of the cases diagnosis was made before operation, and, further, that the number of cases in which operation is performed is small compared to that found at autopsy. As regards the method of operation, Kōnitzer says not sufficient data have been published to indicate which procedure is the best.

He appends a table of 21 cases (including his own) of multiple cysts of the liver operated upon by various authors. In none of these, except his own above mentioned, were more than two or three cysts found : 5 of these 21 patients, or 23.8 per cent., died ; 15, or 71.4 per cent., were cured, and 1, or 4.8 per cent., improved.

NON-PARASITIC CYSTS. Leppmann¹ reports a very interesting case of true non-parasitic cyst of the liver operated upon at the Evangelical Hospital, Düsseldorf, by Robert Schultze and Carl Eckardt. He also gives a brief description of the cases so far published—sixteen in number—that are of interest from a surgical stand-point. He states that on the whole these cysts have been more frequently observed in women than in men. They generally occur in patients beyond forty years of age, although even children are not entirely exempt, the youngest patient operated upon being eleven years of age.

The diagnosis of non-parasitic cysts is often difficult and even impossible. The disease most difficult to differentiate is echinococcus cyst. The differential diagnosis may be established after opening the cyst by laparotomy. In the contents of echinococcus cysts succinic acid and sugar are invariably found, rarely if ever albumin and mucus, while in true cysts of the liver either albumin or mucus, generally both, are present in large quantities.

Leppmann does not believe that cure is possible except by operation. He states that the former method of puncture is no longer practised

¹ "On the True Cysts of the Liver." *Deutsche Zeitschrift f. Chir.*, vol. liv., Nos. 5 and 6.

because, in the first place, it is rarely of benefit ; and, secondly, it is contraindicated because echinococcus may generally not be excluded. Whenever possible these cysts should be extirpated, as in this way recurrence as well as the formation of a fistula is avoided. In this point lies the great importance of differentiating between true cysts and echinococcus cysts, which latter, as a rule, are not shelled out. Madelung suspects—and perhaps correctly so—that many a cyst that was drained in the belief that it was an echinococcus and would not heal, but left a fistula, was not of parasitic origin.

As regards the prognosis, as a rule, nothing definite can be said until after operation. It may be stated, however, that, aside from the dangers connected with every operation upon the liver, the prospects are favorable if complete extirpation of the tumor is possible and if the kidneys are intact. If extirpation is impossible the prognosis is conditioned by the construction of the tumor and the condition of the other organs. If complete extirpation is technically impossible, incision and drainage are indicated.

Hepaptosis. Treves says that the liver is supported by its ligaments, by intra-abdominal tension, by the vena cava, and possibly by intra-hepatic tension. If water is injected into the veins of the liver of a cadaver the under concave surface straightens and may even become convex if sufficient water is injected. Considering the liver weighs between 50 and 60 ounces, the ligaments alone appear rather feeble for the support of the organ. Displacement of the liver, technically known as ptosis, may be of any degree, but can take place in only one direction, namely, downward. This downward displacement is, however, a rotation about a transverse axis passing through the posterior part of the gland. As the right lobe of the liver is much heavier than the left, it often rotates more than the left lobe, giving an oblique direction to the whole organ. A prolapsed liver also becomes deformed and flattened out, especially in its right lobe. The anterior surface of the liver is elongated at the expense of the superior surface, and the inferior surface at the expense of the posterior. A prolapsed liver is often freely movable. This symptom is especially marked if there is a nearly transverse groove across the anterior surface of the right lobe. Such a groove has been commonly ascribed to the pressure of the costal margin against the prolapsed liver. The portion of the right lobe below the groove may become almost separated from the main mass of the gland.

Of eighty recorded cases of ptosis of the liver seventy-three occurred in females. Most of the patients were between thirty-five and sixty years of age. While little is known regarding the cause of the trouble, there is frequent mention in the histories of these patients of feeble muscular development, poor health, thin abdominal wall, herniae, of

prolapse of the whole mass of the intestine, of pendulous abdomen, of movable kidney, and of displacements of the uterus; in other words, the trouble would appear to be largely the outcome of a general relaxation of the tissues of the abdomen. There is no evidence to show the existence of any congenital abnormality of the liver. Three of the male patients appear to have had healthy livers, while the others suffered from cirrhosis, hypertrophy following malaria, and enlargement with ascites in connection with heart disease. Treves says there is no evidence to show that "the barbaric habit of tight-lacing is responsible for this particular deformity." The maximum degree of constriction produced by the corset falls below the mass of the liver. In fifty of

FIG. 53.

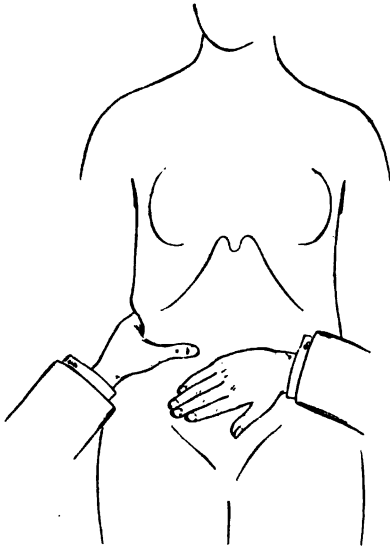


FIG. 54.



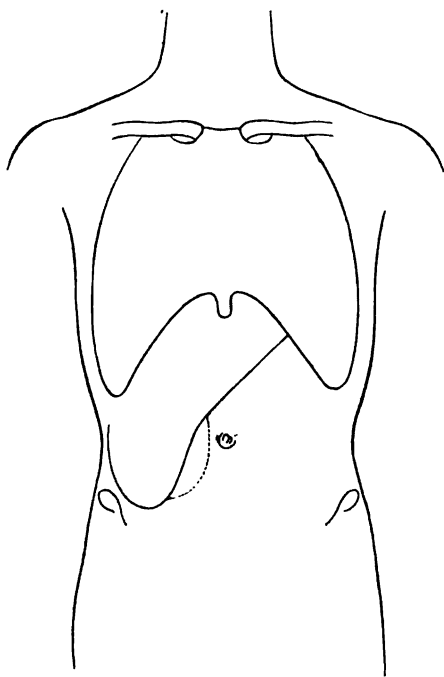
Palpation of liver. (TREVES.)

the eighty cases referred to the liver appears to have been free from disease. In four instances the account is incomplete, while in the remaining twenty-six cases gallstones, cirrhosis, and hypertrophy were mentioned, with one case each of cancer and hydatid cysts.

In a typical case there is a large, rounded, movable tumor in the right side of the abdomen. It moves also with changes in the position of the patient and with respiration. Usually the hepatic notch can be felt. The tumor is dull on percussion and the area of hepatic dulness is depressed according to the degree of ptosis. If the ptosis is present to a marked degree the diagnosis is easy. If it is slight it may be difficult. In any case the determination of the exact lower level of the liver is important and not always easy. The best method of palpation

has been described by Glenard under the title of *le procede du pouce*. The steps are as follows: The patient lies on his back, with the knees extended and the shoulders raised. The surgeon sits on the right side and grasps the right loin of the patient between the thumb and fingers of the left hand, while with the right hand he presses the mass of intestine upward under the liver (Fig. 53). The left thumb is now pressed deep below the liver edge. With the hands in this position the patient is instructed to take a deep inspiration. During this inspiration the left thumb is made to slide from below upward and outward and from

FIG. 55.



Floating lobe of liver. (TREVES.)

behind forward. The edge of the liver should slip past the thumb (Fig. 54). This process is repeated as often as may be necessary to map out the whole edge of the liver.

A floating lobe of the liver may reach the level of the iliac crest (Fig. 55). In rare cases it may be derived from the lobus quadratus, but its usual origin is the right lobe. The tumor simulates a floating kidney, is freely movable, and moves only slightly with respiration. It has rarely if ever been correctly diagnosed. The mistake usually made is to call it a floating kidney. It has also been mistaken for a distended gall-bladder, a tumor of the omentum, a hydatid cyst, and an abscess.

Surgical treatment of a floating lobe has been generally successful. It has sometimes been excised and sometimes sutured to the abdominal wall, while the distended gall-bladder with which the condition is often associated has been treated by cholecystotomy.

The treatment of ptosis of the whole organ by surgical measures is less satisfactory. Much may be done by carefully applied and substantial support. Such support will probably need to be represented by something more elaborate than a belt. It may be desirable to hold up the relaxed abdominal wall by a thin metal plate taking its bearing from a pelvic band. The cases calling for operation are very few indeed. A ponderous organ like the liver cannot be efficiently supported by a few isolated sutures of silk or catgut. The operation can be needed only in extreme examples, and in these a large nervous element will probably have to be reckoned with. Of the measures advised the most sound would appear to be that carried out by Francke, who fixes the liver to the anterior abdominal wall by several rows of sutures. The sutures should be of silk and be passed well into the gland. The incision should be in the right semilunar line when possible. The rest in bed should last for four or six weeks.

SURGERY OF THE PANCREAS.

The surgery of the pancreas has received more attention during the past year than ever before. It was made the order of the day at the International Congress, Paris, August, 1900, and the papers and discussion which it elicited have added much to our knowledge. Prof. Andrea Saturnelli, of Parme, after a careful study of the subject, embodied the results in twenty-four conclusions, the most important of which were the following :

Surgical operation upon the pancreas is in direct relation with all the questions which relate to the function of that organ.

Emaciation, the presence of fat in the stools, sugar in the urine, bronze hue of the skin, jaundice, and pain are the symptoms which usually accompany pancreatic affection.

One encounters considerable difficulty in complete extirpation of the pancreas by reason of anatomical conditions, the deep position of the pancreas, and its intimate relationship with other viscera.

It has been experimentally proved that extirpation of the pancreas is possible and compatible with animal life, and it has been proved from a clinical stand-point in spite of the small number of cases.

Extirpation of the pancreas is not rational in tubercular or syphilitic lesions.

Partial extirpation should be so executed as to leave the two ducts.

The tumors generally found in the pancreas are cysts which may be either cysts of retention or hydatid; and in these cases intervention is justifiable and useful, but extirpation of the organ is not necessary. Extirpation of the cystic sac is sufficient; if this is impossible, incision will answer the purpose. In incision of the sac one should, if possible, suture the walls of the cyst to the abdominal walls.

In case of pancreatic calculi the surgeon may operate to advantage by removing the calculi.

Intervention is justifiable in necrosis of the pancreas to remove necrosed fragments.

In suppuration or gangrene of the pancreas the rule is to abstain during the period of fever; but afterward, if there is either an abscess or gangrene of the pancreas, it is best to intervene, and one is able to make a choice of three routes—the lumbar or extraperitoneal, transpleural or median, and the subumbilical.

Chronic pancreatitis may give rise to complications by compressing the duct or the pylorus, and call for intervention.

In hernia of the pancreas due to wounds reduction and fixation is called for. In contusion and wounds of the pancreas surgical intervention may be necessary, especially if hemorrhage is present. In these cases one can arrest the hemorrhage by suture, or ligate the vessels. In wounds of the pancreatic duct it is possible to suture it; but this should be done, as far as possible, so that no portions of the thread remain in the canal, lest it give rise to concretions.

On complete extirpation of the pancreas one sees the great development of the glands of Galatea. If the pancreatic fluid enters the abdominal cavity it does not always give rise to peritonitis because of its rapid absorption. One may believe—as with bile—that the pancreatic fluid is inoffensive if normal and harmful if diseased. In extirpation of the pancreas it is always necessary to place ligatures before making the incision, in order to avoid hemorrhage and the escape of pancreatic fluid. One should not use the thermocautery or galvanocautery, inasmuch as they do not give sufficient guarantee against hemorrhage, and they may do harm to the neighboring parts.

The Diagnosis of Pancreatic Lesions. This is still attended with great difficulty, but the results of operation in the comparatively few cases of non-cancerous affections of the pancreas encourage the belief that the diseases of the organ offer a fair field for surgical intervention. Just as in the liver we may have acute and chronic catarrh of the ducts, infective and suppurative cholangitis and inflammation of the interlobular tissue ending in cirrhosis, so in inflammation of the pancreas we may have any one or more of those affections, though as yet we have

not learned to recognize acute or chronic catarrh of the pancreatic ducts apart from jaundice, or infective and suppurative inflammation of the ducts apart from abscess of the pancreas itself. For the present pancreatitis is most conveniently divided clinically into acute, subacute, and chronic forms, the symptoms of which are graphically described by Robson.

ACUTE PANCREATITIS is usually ushered in by a sudden pain in the superior abdominal region, accompanied with faintness or collapse, and followed sooner or later by vomiting. It is almost constantly accompanied by constipation, so that it is quite usual for these cases to be mistaken for intestinal obstructions at first. The obstruction, however, is not absolute; flatus passes, and a large enema may secure an evacuation. If the patient survives for several days diarrhoea may supervene. The pain may be so severe as to produce syncope or collapse, and though the pain does not quite pass away it has a tendency to be paroxysmal and to be increased by movement. It is associated by well-marked tenderness just above the umbilicus or between it and the ensiform cartilage. The pain is soon followed by distention in the superior abdominal region, which may become general and does so in the later stages, and by vomiting, first of food and then of bile. The vomiting may be severe, and each seizure may aggravate the pain, but at times vomiting may not be a prominent symptom. Slight icterus from associated catarrh of the bile-ducts is usually present and deepens the longer the patient survives. The aspect is anxious and the face is pinched, resembling the facies peritonitis, which in fact may be present. The pulse, which is rapid and small, is a better guide than the temperature, which may be normal, subnormal, irregular, or high. Delirium comes on in the later stages. The distention, pain, and tenderness prevent an exact examination of the pancreas, which would otherwise be found enlarged. Death usually supervenes from the second to the fifth day from collapse, though in the less acute cases life may be more prolonged. Acute infective pancreatitis thus takes on the form of acute peritonitis starting in the superior abdominal region. If life be prolonged the case comes under the category of subacute pancreatitis, and in that case the onset is usually less grave, though often equally sudden.

SUBACUTE PANCREATITIS may have a sudden onset, with acute pain and vomiting associated with constipation, but the collapse is not marked and may even be absent; the upper abdominal region does not become so rapidly swollen, and vomiting is less severe and less prolonged. At other times the onset is more gradual, though the symptoms may be similar. Tenderness over the pancreas is well marked, and on account of the tympanites being less than in the acute form it may be possible to feel the swollen gland, especially under an anæsthetic. Constipation

gives place to diarrhœa and pus or blood may be noticed in the stools, which have a very fetid odor. The pulse will be less rapid and less thready than in the acute form and the temperature is more regular. The temperature may reach 104° and 105° F., and yet the pulse vary between 90 and 100. The morning temperature may be normal and the evening temperature high for several days or even weeks. Rigors may occur and may be repeated from time to time. The pain occurs in paroxysms, but there is also a constant dull pain at the epigastrium. The patient may lose the more urgent symptoms and appear to be really improving, but loss of flesh and feebleness continue and relapses usually occur, leaving the patient each time more and more feeble, until death supervenes from asthenia. Albuminuria is pretty constant, but glycosuria is rarely present and lipuria is an uncommon symptom.

If an abscess develop the pus may form a tumor projecting in the superior abdominal region and forming a tender swelling behind the stomach, or perhaps come to the surface above or below that viscus; or it may burrow into either loin, forming a perineal abscess, or, passing under the diaphragm, it may form a subphrenic abscess. Occasionally the pus may follow the psoas muscle and form a subperitoneal abscess in the iliac region or, even passing over the brim of the pelvis, it may collect in the left broad ligament. Sometimes the abscess bursts into the stomach and is vomited, or into the bowel and is voided per anum, after which diarrhœa may continue and pus may be seen from time to time as any fresh collection forms and bursts. With the evacuation of the abscess relief occurs for a time and the temperature improves, but relapses usually occur and a mild form of septicæmia persists, with a hectic temperature. Death is the usual termination, but recovery may occur after a tedious and prolonged illness.

CHRONIC PANCREATITIS, at first hypertrophic but later cirrhotic, is usually considered to be a very rare disease, but recent experience shows that it is a much more common affection than has been supposed. Undoubtedly some cases put down as malignant disease of the head of the pancreas, and terminating fatally, are cases of chronic interstitial pancreatitis. Robson operated on a large number of cases of jaundice, depending on obstruction to the common bile-duct, in which the obstructive jaundice, wasting, paroxysmal attacks of pain, and ague-like seizures had given rise to the suspicion of gallstones. In his first case of this nature the operation was undertaken too late, and there was no opportunity for a post-mortem examination. The absence of malignant disease and of other causes than the chronic pancreatitis and associated jaundice to account for the death was directly proved.

Treatment. The treatment in acute infective pancreatitis resolves itself into the treatment of peritonitis commencing in the superior ab-

dominal region. In the early stages the symptoms are too indefinite to warrant operation which would not be justifiable, anyway, until the collapse passes off. Recovery can only follow the evacuation of the septic matter. Drainage can best be performed in the left costal vertebral angle.

In the subacute form of pancreatitis the treatment may be no more than the opening of an abscess which is making its way to the surface, although in some cases an earlier surgical intervention ought to be possible. A median incision above the umbilicus will permit the operator to palpate the pancreas and locate a small collection of pus, which should, if possible, be reached through the left or right costovertebral angle. If this is not feasible the abscess may be evacuated and the cavity stuffed with gauze through the abdominal incision. Robson has cured several cases of chronic pancreatitis by cholecystotomy or cholecystenterostomy. Doubtless, in some of these cases, the manipulation of the indurated tumor detached calculi impacted in the gut, but in others the relief of tension, as the result of draining the bile-ducts, indirectly drained the pancreatic duct and thus led to the subsidence of the pancreatitis, then to an opening of the common duct by the relief of the tension and so to a cure of the patient. If a calculus be felt embedded in the head of the pancreas or impacted in the pancreatic duct it may be reached through the second part of the duodenum by laying open the papilla and exploring the duct, or by dividing first the peritoneum passing between the duodenum and hepatic flexure of the colon and then cutting through the overlying pancreas on the concretion. If the papilla be incised it does not require suture. The anterior duodenal opening requires closing by a mucous and a serous suture. Drainage of the right kidney pouch for from twenty-four to forty-eight hours is advisable.

For attacking the head of the pancreas or the pancreatic duct a vertical incision should be made through the right rectus, and not in the middle line.

The difference in the results of operations for chronic pancreatitis and cancer of the pancreas is well shown by Robson's cases: 17 patients suffering from pancreatitis were operated upon; 16 of them recovered from the operation and all were restored to health excepting 1, who died from an abscess of the liver; 16 patients with cancer of the pancreas were operated upon, only 9 of whom recovered from the operation. In these nine instances the prolongation of life was so short as to emphasize the fact that no operation should be performed upon a pancreas affected by cancer.

CHOLELITHIASIS COMPLICALIS IN PANCREATITIS. Opie directs attention to pancreatic disease as a serious complication of gallstones. As a rule, the common bile-duct and Wirsung's duct enter the duode-

num together, so that it is to be expected that in all cases in which no accessory pancreatic duct enters the duodenum independently a gall-stone lodged low down in the common duct will cause obstruction to the flow of pancreatic juice, lesions of the pancreas, and fat necrosis. Disseminated fat-necrosis stands in much the same relation to disease of the pancreas as jaundice stands to lesions of the liver.

It is worth while, in connection with a subject so little known, to give the points observed by some of the few men who have reported cases of pancreatitis.

PANCREATITIS AND GASTRIC ULCER. Lund reports six cases of pancreatitis between thirty and fifty years of age, five of them women and four having also gallstones. There were two cases of acute pancreatitis, two of acute hemorrhagic pancreatitis, one of necrosis of the entire pancreas following undoubtedly upon a hemorrhagic pancreatitis, and one of localized necrosis of the pancreas terminating in abscess. The three cases of acute hemorrhagic pancreatitis were seen by Lund, who is able to compare the symptoms in these cases with those of four cases of perforating gastric ulcer also observed by him and in which the diagnosis was verified by operation.

"1. In differentiating from perforating gastric ulcer we find the pain not quite so sharp and the tenderness on light pressure not so acute. Moderate tenderness on deep pressure has characterized the cases of pancreatitis; acute pain on light pressure, the cases of perforating gastric ulcer.

"2. The sensation of fulness, as of a tumor in the epigastrium overlain by the stomach, has been noted in all the cases observed by the writer, and in one case observed by Munro.

"3. Muscular spasm was not so marked in these cases as in perforating gastric ulcer or acute appendicitis. In both perforating gastric ulcer and pancreatitis there were localized epigastric tenderness and spasm, but both more marked in the former than in the latter condition."

An absolute diagnosis is generally impossible. One can ordinarily merely say that there is an acute peritonitis originating in the epigastrium and demanding an exploratory incision. Although milder cases of acute pancreatitis and peripancreatitis may recover without operation, an early operation in a severe case is demanded because the primary hemorrhage in itself leads to necrosis and disintegration of gland tissue which may be limited by gauze packing and drainage. Another reason for early operation is the better condition of the patient before he has been weakened by suppuration in the lesser peritoneal cavity.

As the diagnosis must, in a large percentage of cases, be tentative, the first or exploratory incision should be made in the median line above

the umbilicus. This incision may, in severe cases, be made with advantage under local anæsthesia. On account of the weak condition of most of the patients, rapid operating is essential. The great omentum must be traversed to reach the lesser peritoneal cavity. Masses of blood-clot and necrotic fat should be rapidly evacuated. Further hemorrhages may be stopped by gauze packing. It will be generally impracticable to search for bleeding-points.

If blood-clots or pus extend into the left lumbar region drainage should be provided through an incision made upon the finger passed into the most dependent portion of the cavity. It may also be necessary to drain above the spleen, resecting the tenth or eleventh rib for this purpose. The pleura will be cut into, but the pleural cavity will probably be shut off by adhesions.

HEMORRHAGIC PANCREATITIS. Uhthoff and Maynard report a case of hemorrhagic pancreatitis occurring in a stout man, aged seventy-seven years, of previous good health excepting some recent symptoms of "indigestion." One day he was seized about 11 A.M. by abdominal pain, nausea, vomiting, and collapse. There was blood in the vomited matter. His condition improved toward night and the following morning, but in the evening he had another collapse, the symptoms lasting two or three hours. On the evening of the next day he had a third collapse from which he only partially rallied, and on the following afternoon symptoms of collapse again appeared and the patient died soon afterward. In the lesser peritoneal cavity there was a little blood-stained fluid. The pancreas was firmly adherent to adjacent structures, its capsule was thickened and tough, and there were small spots of fat necrosis throughout the gland. In the head of the pancreas was a large hemorrhage, and there were numerous smaller hemorrhages scattered throughout the body of the gland.

Stockton and Williams report a case of hemorrhagic pancreatitis with fat necrosis occurring in a patient who also suffered from biliary calculi both in the gall-bladder and in the common duct. The patient died twenty-eight hours after operation for the removal of the calculi, and some of the hemorrhage found in the pancreas may have been due to the difficult manipulation necessary to extract the stone. Some of the hemorrhages had evidently existed much longer than this, however, and may have dated from an injury received four months previous to operation. In any event the coincidence of pancreatitis and gallstones is worthy of notice.

This coincidence has also been spoken of by Richardson, who says that the differential diagnosis between these two diseases is often a most difficult one. Take, for example, the following case: A man, aged forty-three years, had typhoid fever in 1881. In April, 1892, he was seized

in the night with severe pain in the pit of the stomach, lasting three or four hours. There was no jaundice. In the next three years he had several similar attacks. In March, 1895, such an attack was for the first time followed by jaundice. There was a loss of twenty-five pounds in weight. After several attacks of varying severity he was seized, in December, 1895, with an attack of pain and jaundice which lasted for two weeks. Exploration showed a tumor of the head of the pancreas. It seemed so evidently a case of malignant disease that the gall-bladder was not opened. The patient recovered from the exploration, at once began to improve, and continued to do so until he regained his perfect health. Up to the time of report, five years later, he had had no further difficulty. In the light of the history it seems possible that a stone may have been situated beyond the junction of the pancreas with the common duct, and that the enlargement of the pancreas may have been due to obstruction of the canal of Wirsung, with engorgement and possibly other changes in the gland, and that the digital manipulations of the pancreas may have forced the stone into the duodenum.

The uncertainty entertained after digital examination of an enlarged pancreas permits one to hope that the disease is benign—a simple hyperplasia, a chronic inflammation, a cyst with tense walls and atrophying gland, or a mild infection through the canal of Wirsung. Such lesions are by no means unknown; doubtless many of them come and go without even being suspected, their symptoms being referred to indigestion and their presence being beyond detection; for a pancreas affected enough to compress the common duct may be impossible of detection by palpation. It may be even detected with difficulty when the abdomen is opened. A pancreas as large as the fist may not be palpable in stout and muscular subjects or until an exploration is made. For aught that we know, an organ so deeply situated may be especially liable to mild affections attended by changes in its actual size and consistency. Assuming that such changes do occur, it must be concluded that they are usually self-limited and curable, since they are so seldom seen upon the autopsy table, but they are still of interest in a discussion of surgical treatment of the pancreas as a possible explanation of attacks of transitory jaundice upon which a mistaken diagnosis of gallstones is occasionally based.

Surgeons are more closely interested in chronic pancreatic enlargements, which, by encroaching and closing the common duct, may threaten life. Pathologists have long warned observers against mistaking inflammatory lesions in the pancreas for malignant disease. On the other hand, the diagnosis between impacted gallstones and carcinoma and other diseases of the pancreas is often impossible. Even if a diagnosis of gallstone impacted in the common duct is made, it by no means follows

that there is not disease in the head of the pancreas. Furthermore, the reverse is true that if there is a tumor of the pancreas it by no means follows that there is no gallstone.

Richardson does not hesitate to operate in these cases of uncertainty of the cause of obstruction where the fact of obstruction is clear.

"The indications for operation when symptoms show that the biliary flow is permanently obstructed along the course of the common duct are to explore unless the diagnosis of hopeless malignancy is clear; to explore in prolonged jaundice when there is a history of gallstones; to explore even without a history of gallstones, provided that the patient shows no cachexia; to explore when there is a tumor in the region of the pancreas without signs of malignancy. The justification for these rules, by which I am more and more inclined to be guided, lies in the prognosis of those cases when left to themselves. Gallstones impacted in the common duct destroy life unless they escape into the intestine. Even then so slow is the natural process that they may leave permanent contractions even more difficult and dangerous of relief than the removal of the stone itself in the first instance. Moreover, the dangers during the process of ulceration into the intestine are great, and even in the intestine the gallstone may cause obstruction."

The first incision should be very small—just large enough to admit the finger. The presence or absence of serum should be noted. Free fluid almost invariably means malignant disease, and if the finger is passed to the gall-bladder, foramen of Winslow, duodenum, and pancreas, cancerous nodules will undoubtedly be felt. In case no contra-indication is developed the incision should be enlarged to admit the hand, when the whole tract between the gall-bladder and the duodenum can be explored and the pancreas examined. It is worth while to inspect the omentum and mesentery, since areas of fat necrosis may be associated with similar changes in the pancreas and may thus indicate the benign character of an otherwise apparently cancerous pancreatic tumor. Supposing a smooth, hard tumor of the pancreas is found, metastatic nodules and other evidences of malignancy being absent, it is difficult for the surgeon to decide what to do. An abandonment of the operation means absolute hopelessness, while an incision into the mass means a difficult and bloody dissection; however, if the patient is strong there is no reason why the attempt should not be made. If the tumor proves to be malignant the operation should be abandoned; if gallstones are present in connection with a tumor of the pancreas they should be removed and the gall-bladder drained. Such treatment may be followed by perfect recovery, as was shown by a case of Richardson's in which the head of the pancreas was hard and as large as the fist.

Cysts of the Pancreas. At the Twenty-ninth Congress of the German Society for Surgeons, Berlin, April 19, 1900, Bessel-Hagen, of Charlottenburg, read a paper on "The Operative Treatment of Cysts of the Pancreas," in which he describes a new method of operation which he successfully used in a most difficult case of cyst of the pancreas, and which he believes will have to be adopted in similar cases, rare though they be, where every other avenue is closed and all of the other known procedures are excluded.

As regards the general status of results of operations for cyst of the pancreas, Bessel-Hagen states they certainly must be considered highly satisfactory; while Körte, in his book upon *Diseases of the Pancreas*, published in 1898, reported 121 cases, with 10 deaths, Bessel-Hagen states that he has been able to collect 149 cases of pancreatic cyst, including his own, without increasing the number of deaths.

In 19 cases total extirpation of the cyst was done, with 17 cures and 2 deaths. In 12 the attempt to extirpate the cyst proved impossible, all that could be done being partial loosening and dissection of the cystic wall, the remainder being sutured in the abdominal wound. This operation was fatal in 4 instances. In all the other cases, 118 in number, the method introduced by Gussenbauer in 1882 was used. The same consists in suturing the cystic sac into the abdominal wound and subsequent opening and drainage. This method has yielded the best results, in that only 5 of the 118 patients died.

The personal case of Bessel-Hagen was that of a boy, aged thirteen years, who, after an attack of influenza, complained of severe pain in the region of the stomach; repeated vomiting; fever. The patient was greatly emaciated. Abdominal covering was very tense, and in the epigastric region, slightly to the left, an absolutely immovable tense swelling was noticed which extended downward to the umbilicus and disappeared under the protruding costal arch; it was very sensitive to pressure. Careful examination being impossible on account of great pain, an exact diagnosis could not be made without laparotomy. A longitudinal incision to the left of the median line was made. The stomach had become enormously expanded. A cystic tumor could be distinctly felt behind it. From the abdominal cavity, below the stomach, a yellowish peritonitic fluid, mixed with fibrinous flakes and coagulum, oozed out. Further examination became exceedingly difficult. It was impossible to determine the outline of the tumor by palpation, and the boundary line between cyst and stomach seemed obliterated. Thus extirpation could not come into consideration. Suturing of the cyst in the abdominal wall, with subsequent opening and drainage, could not be accomplished in the usual way. After considering various other possibilities, all of which had to be rejected, the only method that

offered any hope of saving the patient's life was that of widely opening the anterior wall of the stomach, followed by opening and emptying of the cyst from the inner cavity of the stomach—palpation of the cystic cavity, and from there the finding of a place suitable for suturing into the abdominal wound and for the establishing of a pancreatic fistula. This was finally decided upon. A longitudinal incision, 5 cm. in length, was made in the anterior wall of the stomach, another small incision in the posterior wall, and thence the cyst opened. A yellowish fluid mixed with fibrinous flakes escaped. Infection of the abdominal cavity could be easily avoided. Separation of the cyst from the stomach was impossible. Suturing of the cyst in the abdominal wound at the usual site was impossible, nor was the establishment of a left-sided lumbar fistula feasible. After some difficulty, Bessel-Hagen succeeded in slightly pulling forward from underneath the ribs the large curvature of the stomach, and there, behind the arteria and vena gastro-epiploica sinistra, in the lateral portion of the cystic wall, a small space suitable for suture and drainage was detected. However, it yet required a special operation to bring this spot into contact with the abdominal wound. This was finally accomplished, and opening of the cyst for the purpose of establishing drainage at the sutured spot constituted the last step of this most difficult operation. Two months after operation the cyst had become obliterated and the pancreatic fistula closed; the patient had gained twenty pounds. A small after-operation had to be done to avoid the development of a hernia. The boy is now perfectly well and takes part in foot-ball and other sports requiring a healthy body.

SURGERY OF THE SPLEEN.

In the *Arch. f. klin. Chirurgie*, 1900, vol. lxii., No. 1, Bessel-Hagen contributes a valuable article entitled "A Contribution to the Surgery of the Spleen." He states that in view of the experience we have gained within the last decade it is evident that splenectomy must be recognized, with more certainty than heretofore, as an important—in some forms of the disease even as the only effective—remedy at our command. Of course, in the presence of a leucæmic condition of the blood operation is absolutely contraindicated, as also in hypertrophy of the spleen resulting from atrophic cirrhosis of the liver and in amyloid spleen. In these cases extirpation of the spleen has always proved injurious or at least useless. It is principally in the treatment of tumors of the spleen due to malaria, or idiopathic hyperplasia of the spleen, especially if occurring with consecutive cirrhosis of the liver, that splenectomy has gained ground.

Bessel-Hagen has collected 360 cases of extirpation of the spleen, with 138 deaths, or a mortality of 38.3 per cent. If, he says, Ceci and Vulpis in 1894 place the mortality at 51.6 per cent. and 49.6 per cent., the difference between these figures and my own speaks for a decided improvement in results. This improvement is still more noticeable, he states, if we separate the older cases from those operated upon during the last decade and also exclude, in the first place, the cases in which operation is now contraindicated, such as leucæmic tumor of the spleen, atrophic cirrhosis of the liver, congested and amyloid spleen; in the second place, operations in cases of subcutaneous injury and laceration of the spleen, as also those done for torsion of the pedicle of a floating spleen. On this basis the results would be thus:

Of 97 laparosplenectomies done up to 1890, 41 died, showing a mortality of 42.2 per cent.; of 161 operations done between 1891 and 1900, 31, or 18.9 per cent., died. There is no doubt, Bessel-Hagen states, that the percentage of cures will be considerably increased in the future. He then proceeds to give the results of splenectomy in the various forms of disease in which it has been performed.

Of 35 cases in which extirpation of the spleen was done for leucæmic hypertrophy up to 1890, 33, or 94.3 per cent., died; of 7 done since 1891, 5, or 71.4 per cent., died; and of the 4 who survived operation only 1 lived for a longer period after operation. Almost without exception the foregoing deaths were due to hemorrhage. Bessel-Hagen therefore concludes that extirpation of a leucæmic tumor of the spleen must be considered an unpardonable mistake so long as we are unable to control the leucæmic bleeding. The same is true in regard to splenectomy in cases of hypertrophy of the spleen due to atrophic cirrhosis of the liver, congested and amyloid spleen. Nothing has been achieved by operation in these cases, every one of the seven operations having resulted in death. Also in case of splenic hypertrophy in malarial patients in whom shrinkage of the liver and ascites have become pronounced, operation should not be performed.

Up to 1890 splenectomy has been done on account of injury and laceration of the spleen within the abdominal cavity in 3 cases, all of which resulted fatally; since 1891, in 34 cases, with 14 deaths, or 41.2 per cent. Equally good, if not better, have been the results of splenectomy in cases of intrasplenic suppurative inflammations, in perisplenic and parasplenic abscess formation, cystic tumors and true neoplasms of the spleen. In abscess of the spleen only some cases will be found suitable for splenectomy, while others had better be treated by simple opening of the abscess cavity. Total extirpation of the spleen for intrasplenic, perisplenic, and parasplenic abscess was performed seven times—three up to 1890, four since 1891—with no deaths. For tuberculosis

the spleen was extirpated once up to 1890, with one death ; since 1891 twice, both patients being cured.

As much as the results obtained in tuberculosis and suppurative inflammation of the spleen may speak in favor of splenectomy in these cases, the entire six operated upon within the last ten years having been cured, it should be remembered that the operation should be undertaken only if the spleen can be dissected without trouble and, above all, without the danger of causing suppurative infection of the abdominal cavity.

For the cure of cystic tumors, particularly echinococcus cysts of the spleen, several methods come into consideration. Bessel-Hagen states, however, that if the spleen is free from adhesions and the patient's condition permits, splenectomy is beyond doubt the superior procedure, both as regards immediate and permanent results. He has found 5 cases of this kind up to 1890, with 3, or 60 per cent., deaths ; since 1891, 10 cases, with 1, or 10 per cent., mortality.

Total extirpation of the spleen for small cysts with serosanguinolent contents in 4 cases prior to 1891 ; in 3 since then. All of them were cured. This certainly shows a great improvement over the mortality given by Ceci and Vulpius in 1894, namely, 40 per cent.

Also, with regard to sarcoma, the mortality has decreased from 40 per cent. in 5 cases operated upon up to 1890 to 25 per cent. in 4 cases operated upon since then.

Bessel-Hagen records 2 cases of total extirpation of the spleen for benign neoplasm and splenolithiasis since 1891, with 1 death.

While the question of the indication of splenectomy in the foregoing forms of disease has been definitely settled, there is some doubt still as to the limits to be set for the operation in cases of hypertrophic malaria spleen and different forms of primary hyperplasia. As to hypertrophy of the floating spleen, Bessel-Hagen states that while all efforts directed to preserve the same, especially if it be otherwise healthy, should have our approval and support, he thinks that if the hypertrophy be at all pronounced, splenectomy should receive the preference over splenoplexy. If other diseased conditions are suspected in a transposed and swollen spleen, splenectomy should be the only operation considered.

In 5 cases of total extirpation for torsion of the pedicle of a floating spleen, with hypertrophy due to malaria, 2 were operated upon before 1891, with 1 death, or 50 per cent. ; 3 since 1891, with 1 death, or 33.3 per cent. In 16 cases complicated with simple hypertrophy 5 were operated upon before 1891, with 4 deaths, or 80 per cent. ; 11 since 1891, with 4 deaths, or 36.3 per cent. Bessel-Hagen's opinion is that, with the onset of sudden and serious exacerbation of symptoms in a freely movable spleen, laparotomy should be resorted to without

hesitancy. More than this, he says, we should free the patient of his floating spleen as soon as its existence has been definitely determined, so as to protect him against the danger of torsion. To show that the risk of operation is slight he cites the statistics of Stierlin, based upon 32 cases collected from the literature and published in 1897, according to which the mortality of splenectomy in floating spleen alone, without separating malaria cases, was 6.25 per cent. His own researches show that among 26 cases of movable and transposed floating spleen complicated with malaria only 1 resulted fatally after splenectomy, while in 45 extirpations of simple floating kidney not complicated with malaria there were 5 deaths. Of a total of 43 cases of floating spleen complicated and non-complicated with malaria 40 were cured by splenectomy within the last ten years, and the 3 deaths resulting were due to mistakes in the technique of the operation. We are, therefore, fully justified in looking upon total extirpation for floating spleen as an equally harmless, simple, and promising operation. Another point of vast importance is the great improvement in the general health of the patients.

With reference to non-movable forms of hypertrophic malaria spleen and idiopathic hyperplasia of the spleen, Bessel-Hagen states that the results of the last years hardly leave a doubt that also in these cases operation should not be deferred too long. He considers it indicated as soon as internal medication becomes inefficient and the disturbances caused by the size of the tumor make life a burden to the patients. However, we must select our patients. When there are firm adhesions operation should not be done. He has collected 88 cases of hypertrophic and fixed malaria spleen: 24 of these were operated upon prior to 1891; 61 since then, with 15 deaths in each period, thus showing a decrease in the mortality from 62.5 per cent. to 23.4 per cent. In order to give a correct idea as to the value of splenectomy in these cases, it is but fair to state that in 5 of the cases of the second period greater familiarity with the technique would undoubtedly have saved the patients' lives, and 5 of the cases should not have been operated upon, as there were extensive adhesions and other serious complications. This would have changed the mortality to 5 in 54 cases or 9.2 per cent.

In primary or idiopathic hypertrophy of the spleen splenectomy is to be considered imperative. The improvement in results of operation during the last decade is remarkable. While prior to 1891 the mortality in a series of 18 cases was 61.1 per cent., it was 13.3 per cent. in the 15 cases operated upon since then; and here again 1 death was due to mistake of the operator. Excluding this case the mortality would have been only 7.1 per cent.; so that Bessel-Hagen considers it advisable, in view of the lack of efficient medicaments, in all cases belonging to the group of idiopathic hypertrophy of the spleen, to sacrifice the latter at

an early stage of the disease in order to save the more important organ, the liver, from serious and incurable disease.

Bessel-Hagen adds the highly interesting histories of three successful cases recently treated by him, one having been operated upon for primary hyperplasia of the spleen with interstitial hepatitis, the other for almost complete suppuration and necrosis of the spleen after gangrenous chancre; the third for multiple intrasplenic abscesses following appendicitis, with encapsulated abscess formation and sepsis. In the first splenectomy was done, in the second splenotomy, and in the last splenotomy, with partial extirpation of the spleen after resection of the ninth and tenth ribs.

Mikaulovsky, of Sofia, at the last International Congress, reported sixteen cases of extirpation of the spleen for malarial enlargement. He employs the median incision in those cases in which the spleen is movable and the lateral incision when it is fixed and adherent. In those cases with large pedicle he employs two ligatures and sutures the abdominal wall with three-layer sutures of silk. The after-history is usually that of an ordinary laparotomy. He advocates mobilizing the intestines for the first two days by means of opium. He gives some very valuable information as to the after-histories of the sixteen patients operated upon by him. In these he has had but one death from pleuropneumonia, and this was due to the fault of the assistant, who, before operation, allowed the patient to remain in a cold bath for an hour. In spite of this the mortality of 6.2 per cent. is remarkably low. Several of the patients who were seen more than one year after operation were so much improved in health and appearance that they were hardly recognized. The weight of the spleens removed varied between 1800 and 4000 grammes.

Splenectomy. At the International Congress of Surgery, Paris, 1900, Connesco,¹ of Bucharest, reported 32 splenectomies which he had performed since 1896—28 for malarial hypertrophy, 3 for leucæmia, 1 for hydatid cyst. The conclusions arrived at from his last experience were that in leucæmic hypertrophy operation is indicated only when the general local conditions are satisfactory. The three cases operated upon died without other complications than the leucæmic stage.

Splenectomy is the operation of choice in hydatid cyst. In enlargement due to malaria there were 8 deaths in 28 cases. Connesco believes that extirpation is always indicated except under the following conditions: Cirrhosis of the liver, extensive parietal adhesions, pronounced ascites, pleurisy, poor general condition.

Among the post-operative complications may be mentioned ordinary congestion, pericarditis, pleurisy, local hemorrhage, and bronchitis.

¹ *Revue de Chirurgie*, September, 1900, No. 9.

Connesco advises only fine catgut for suture of the pedicles.

As to results, he states that the therapeutic effect of extirpation of the spleen for malaria is excellent; the febrile rise of temperature and malarial cachexia disappear.

Four patients, operated upon four, three and a half, three, and two years ago, were completely restored to health.

The number of red blood-corpuscles increases rapidly from 2,000,000 to 3,000,000 to 5,000,000 and 6,000,000, while the white corpuscles soon return to the normal proportion.

Of 8 cases of disease of the spleen reported by Subbotic¹ 7 were women, and all patients with dislocated or movable spleen were women. The ages ranged between twenty-one and fifty years.

In 6 cases splenectomy was performed, with 2 deaths due to peritonitis. A remarkable coincidence is that in 4 of these cases torsion of the pedicle was found, twice to the extent of 180 degrees, once to 360 degrees, and once to twice 360 degrees (?).

Whenever the tumor cannot be controlled by bandages, and it becomes a source of great discomfort to the patient, operation is indicated. Subbotic considers splenectomy the simplest operation for movable spleen. The difficulties increase in proportion as adhesions are encountered. Cases in which the tumor of the spleen is fixed to the diaphragm by firm adhesions must be considered the most difficult and dangerous. Only when clearly indicated should operation be done in these instances. Leucæmia constitutes an absolute contraindication for splenectomy.

SURGERY OF THE APPENDIX.

Diffuse Suppurative Peritonitis Proceeding from the Appendix.

Among all the recent publications bearing upon this subject the most noteworthy and valuable is the monograph of Krogius, of the Surgical Department of the University of Helsingfors, published by Fischer, of Jena, 1901, entitled "Ueber die vom Processus vermiformis ausgehende diffuse eitrige Peritonitis und ihre chirurgische Behandlung."

Although the work contains most interesting chapters on the history, etiology, and pathology of peritonitis, space will not permit me to do more than briefly review the portion devoted to the treatment and its results.

TREATMENT. After reviewing the general principles that have been followed in this class of operations by other leading surgeons he gives a brief account of some of the principal methods employed.

¹ Deutsche Zeitschrift f. Chirurgie, vol. liv., Nos. 5 and 6.

Many different methods were used in his own series of cases, but the one which he considers best and which he used in most of his cases is as follows :

An incision is made along the lateral border of the right rectus muscle, starting from a point slightly below the umbilicus and extending to a few centimetres above Poupart's ligament. After opening the peritoneum and mopping out the suppurative secretion with gauze compresses the appendix is located and removed ; then the loops of small intestine situated mesially from the cæcum are pushed aside and the hand is introduced toward the small pelvis, out of which generally large quantities of pus escape. The hand is then directed toward the left side of the abdominal cavity and, under guidance of the same, an incision is made along the lateral border of the left rectus muscle, through which the exudate there present is evacuated and the left side of the abdominal cavity is cleansed. By introducing the hand successively through both incisions toward the upper part of the abdominal cavity this portion also is thoroughly examined, special attention being paid to the sub-phrenic space. After cleansing the abdominal cavity as completely as possible by means of dry absorption a large Mikulicz iodoform gauze bag is passed through the right wound to the base of the small pelvis, which is filled with a strip of sterile gauze. A second Mikulicz tampon is passed through the left wound and in a downward direction. Frequently two similar tampons are directed toward the upper part of the abdominal cavity. The outer dressings are frequently changed. The inner tampons, which, as a rule, soon become highly offensive, are renewed within a few days, while the outer bags are left in place for eight days or longer.

Intravenous saline infusions are freely used during after-treatment, and Krogius says he has seen remarkable results from the same. He prefers enemata and intestinal irrigation to laxatives. In cases of pain and restlessness he does not hesitate to give sufficient doses of morphine to alleviate the condition.

The main point, he states, is to gain free access to all parts of the abdominal cavity. In view of the difficulty of removing the exudate in the small pelvis through the abdominal wound, it might be advisable in women to make a counter-opening in the posterior wall of the fornix vaginae. In men, he thinks, he would be willing to try facilitating drainage by means of a parasacral opening.

So far he has never washed out the abdominal cavity for the simple reason that he could not see that it could possibly aid disinfection in suppurative peritonitis. He adds, however, that in view of the high praise this procedure is receiving from experienced surgeons he would be willing to try it in a suitable case. Drainage by means of two or

more large Mikulicz tampons he considers superior to any system of drainage tried by him. He points out the importance, during after-treatment, of carefully watching the signs of a possibly developing secondary abscess and opening the same in time. He has had opportunity twice of opening a secondary subphrenic abscess; three times a pelvic abscess, and only after this did complete convalescence occur.

RESULTS OF SURGICAL TREATMENT. Krogius has made a most elaborate study of all the cases of general peritonitis following appendicitis that have been published in medical literature. In addition he gives a detailed report of 50 cases operated upon by himself, 16 of which represent cases observed between 1889 and 1897, all of which died, 12 with and 4 without operation. On the other hand, in the last three and a half years, during which time he has systematically treated suppurative peritonitis by operation, very encouraging results have been achieved in that of 30 cases (partly operated upon at the clinic, partly representing patients of his own private practice) 9, or 30 per cent., were cured; 13 of these cases were treated in his private practice, with 6, or 46 per cent., cures.

Krogius has combined the statistics of fifty-eight leading surgeons showing 680 cases of general peritonitis treated by operation, with 194 recoveries and 486 deaths, or a percentage of 28.5 cures. Adding to these all the cases known to him from the literature as having been cured, Krogius finds a total of 285 cases which with his 9 personal cases make 294 cases of general suppurative peritonitis following appendicitis cured by operation.

Bacteriological Investigation in Acute Appendicitis. H. C. Low, in the recent Medical and Surgical Reports of the Boston City Hospital, publishes the results of bacteriological investigations in 100 cases of acute appendicitis. Only cases of less than three weeks' duration are included. In every case the cultures were made with sterile cotton swabs from the abscess itself or the principal infection. These cases are valuable inasmuch as the cultures were made in every instance in Löffler's blood-serum, prepared according to the methods of Mallory and Wright. In 42 of the cases cultures were made at the same time in agar-plates, and in 30 cases in neutral glucose bouillon; streptococcus pyogenes, pure cultures, were found in 2 cases; streptococcus pyogenes or diplococcus lanceolatus and bacillus coli communis in 61 cases; streptococcus pyogenes and intestinal saprophytes, 15 cases; bacillus coli communis, pure culture, 8 cases; bacillus coli communis and unidentified cocci, 13 cases; bacillus lactis aërogenes and bacillus pyocyaneus 1 case.

Thus bacillus coli communis occurred in 81 per cent. of the cases. In 13 of the cases in which the bacilli communis and unidentified cocci

were found Low states that there were undoubtedly streptococci which did not grow in culture. He believes that the percentage of cases in which the streptococcus is reported is not as high as it should be. In cases under three days' duration the streptococcus pyogenes was found in 81 per cent. and bacillus coli communis in 62 per cent. In cases of two or three weeks' duration the streptococcus pyogenes was present in 55 per cent. and bacillus coli communis in 87 per cent.

The fact that the bacillus coli communis is more frequently reported in cases of considerable duration gives weight to the suggestion that the bacillus coli communis is present as a secondary infection. Low states that the results of these cases show clearly that the streptococcus and other pyogenic organisms are present in a very large percentage of acute appendicular abscess. Low adds that most observations, like those of Kelly, who found the bacillus coli communis in pure culture sixty-nine times in ninety-four cases of acute appendicitis and the streptococcus present in only one, have been made with agar and bouillon media, which are unsatisfactory for the growth of the streptococcus, which dies out very quickly in these media. Low believes that a previous growth of the intestinal bacilli quickly destroys the streptococci.

Appendicitis and its Relation to Trauma. M. Neumann¹ states that at the Surgical University Clinic (Prof. Bramann) at Halle the operation for appendicitis is generally done in two sittings. At first the cavity is inspected and the appendix, without being disturbed much, is embedded in sterile gauze, and the entire cavity is tamponaded. If the fever does not subside after opening of the abscess, exact tamponade, and drainage, and there be no other complications present, another larger abscess must be suspected and looked for. After the secretion has ceased and the last drain is removed the preparations for the second operation—the amputation of the appendix—are begun. This stage has been noted to set in all the way from nine to fifty-five days after the first operation. The peritoneum may then be opened without danger and the appendix searched for and removed. The advantages of this procedure are stated as follows :

Material shortening of the first operation, at which time the strength of the patient is always more or less impaired without lessening the value of such measures as are employed to preserve life.

It avoids the propagation of an already existing peritonitis or the causation of peritonitis by opening the hitherto closed peritoneal space.

It insures total and safe removal of the appendix down to the cæcum, with the patient in good strength and the peritoneum in normal condition as regards absorbing capacity.

¹ Arch. f. klin. Chirurgie, 1900, vol. lxii., No 2.

Loosening and prevention of adhesions by the secondary amputation.
Positive prevention of abdominal hernia.

The time of treatment by this method has been found to vary between thirty and seventy-six days from the date of the first operation.

Of 152 cases observed at the clinic 121 were operated upon.

As regards trauma, Neumann does not believe it probable that an absolutely healthy appendix without contents could be so struck by an injury as that a direct lesion should result, the organ being too small and its fixation not firm enough. It may be different if the appendix contains some firm body, as for instance a fecal calculus.

He has found but few cases in the literature in which the attack was traced to a trauma and fewer still in which this was proved by operation or dissection.

Fowler in going over extensive material mentions but two cases of trauma, but adds: "According to my opinion, the severe muscular exercise did not in either of the cases bear any causative relation to the attack of appendicitis."

In Stern's treatise on *The Traumatic Origin of Internal Diseases*, Neumann has found three cases noted in which the attack was traced to a trauma and in which this was confirmed by operation or dissection.

In the *Sanitary Reports of the Royal Prussian Army* he found 73 cases of appendicitis recorded between 1890 and 1897. Of these 3 cases (first attack) were ascribed to trauma.

Out of Körte's 150 cases of appendicitis Borchardt cites 3 of traumatic origin.

Lately Schottmüller has reported 3 cases of traumatic appendicitis observed at the General Hospital of Hamburg.

Among the 152 cases of appendicitis observed at the clinic in Halle trauma has been noted as an etiological moment in 10 instances. In 9 out of these 10 a fecal calculus was found in the diseased appendix. In every one of these, according to the histories, the processus had been perfectly healthy up to the time of the injury.

Neumann's views as based on the cases observed at the Halle Clinic are as follows:

A trauma, either direct or indirect, is capable of producing appendicitis in a hitherto healthy processus.

In the great majority of cases trauma can cause a lesion of the appendix only if the latter contains a fecal stone or something similar.

The fecal calculus does not push through the entire intestinal wall on receipt of the injury, but causes a rent in the same, and from this infection proceeds.

The treatment of traumatic appendicitis is the same as that pursued in other cases of severe appendicitis.

Subphrenic Abscesses after Appendicitis. Julius Weber¹ states that of 600 cases of inflammation of the cæcum, operated upon at the Moabit Hospital and in the private practice of Prof. Sonnenburg, there were 350 cases of appendicitis with abscess formation. Of these 9, or 2.5 per cent., were complicated with subphrenic abscess; 7 of the latter were operated upon, with 3, or 42 per cent., deaths, and 4, or 58 per cent., cures. Those not operated upon died. The total mortality, therefore, was 55.5 per cent.

Maydl has reported a total mortality in cases of subphrenic abscess after perityphlitis of 56 per cent. and of 35.7 per cent. in the cases that were operated upon.

It may seem remarkable that there should have been only 9 instances of subphrenic abscess in a series of 600 cases of diseases of the appendix. This is probably due, Weber says, to the very radical and relatively early operative treatment of suppurative appendicitis customary at the hospital, especially in cases where the abscess is found high up. It also may be partially ascribable to the extensive tamponade employed in the after-treatment.

As regards the method of operation, the broad incision or resection of the ribs was generally used: 6 of the 9 cases were complicated with right pyothorax; in 1 of them only could the development of the same be traced to perforation of the diaphragm, a defect the size of a silver half-dollar being found in the diaphragm near the "kuppe." This case thus confirms the claim of Sach's that intraperitoneal abscesses perforate the diaphragm at the "kuppe." Weber believes, with Sachs, that in a large number of cases the abscess develops intraperitoneally; while Maydl emphasizes that in perityphlitis the abscess usually develops retroperitoneally. In conclusion Weber says that from the cases reported it would seem justifiable to assume that the anatomical development of a subphrenic abscess depends upon that of the appendicular abscess; in other words, if the latter be located intraperitoneally, the development of the subphrenic abscess will likewise be intraperitoneal.

Anatomy of the Cæcum and Appendix. The most recent original work upon the anatomy of the cæcum and appendix has been done by Pérondi, of Florence.² He states that the majority of anatomists regard the right iliac fossa as the habitual seat of the cæcum, but it would be an exaggeration to consider this disposition as constant. The old researches of Engel confirmed by the later investigations of Treves, Tuffier, Hewson, and others demonstrate the frequency of anomalies in the location of the cæcum. It is well-known that most of the classical writers

¹ Deutsche Zeitschrift f. Chirurgie, February, 1900.

² Revue de Chirurgie, August, 1900, p. 221.

taught formerly that the whole anterior portion of the cæcum was covered with peritoneum. Bardeleben was the first to dispute this in 1849. Later Luschka, in 1861, Lanjer, in 1862, and more recently Fromont, have confirmed the opinion of Bardeleben. Pérondi has made a careful study of the cæcal region in 50 cadavers at the Anatomical Institute of Florence. He found that the ordinary position of the cæcum was in the most dependent part of the right iliac fossa. It occupied the inferior position in 83 per cent. of the cases. In 14.58 per cent. the cæcum was found in the middle and in the same proportion of cases in the upper part. In 25 per cent. of the cases the cæcum had abandoned the iliac fossa; it was found in the pelvic cavity in 7 cases, in the umbilical region in 3, in the lumbar fossa in 1, and in 2 cases the cæcum had disappeared. The direction of the cæcum is ordinarily as follows: The axis of the cæcum is obliquely to the right, upward and inward. In 2 cases he has found the cæcum vertical, and in 2 it was absolutely transverse. The serous covering appeared to be complete in 75 per cent. of the cases. The length of the cæcum he found to be in the neighborhood of 6 cm. 1; the average width was 3 cm. 1; but the variations are numerous. In one case the vertical diameter of the cæcum attained 11 cm. and in another the width of the organ surpassed 8 cm. 5.

The mode of insertion of the ileum into the cæcum also differed widely. Most frequently the terminal segment of the ileum entered the cæcum transversely.

In the great majority of the cases the appendix presented a regular cylindrical form; it was generally found in a vertical position and to the inner side of the cæcum; in 10 cases, however, it was behind the cæcum. The average length of the appendix was 7.6 cm., its average width 5 mm.

LIGATION OF THE ABDOMINAL AORTA.

Among the unusual operations upon the abdomen performed during the past years must be mentioned the ligature of the abdominal aorta below the diaphragm by Keen,¹ of Philadelphia.

The patient was a man, aged fifty-two years, with a probable history of syphilitic infection. The symptoms of aortic aneurism began about two months prior to operation. The patient had refused a proposed operation of wiring and left the hospital. Five days later he was brought back per ambulance complaining of great pain in the left side of the abdomen. His condition was alarming, as he was practically in collapse. Believing that the aneurism had ruptured and fearing fatal

¹ American Journal of the Medical Sciences, September, 1900.

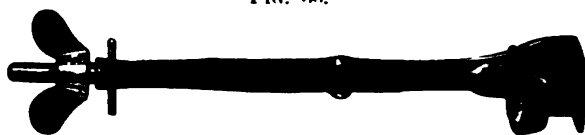
hemorrhage, Keen operated on November 29, 1899. A large retro-peritoneal hemorrhage had taken place from the aneurism, and an immense hæmatoma had formed under the external layer of the mesocolon. In view of the size of the clot and the certainty of an enormous hemorrhage if it were removed, Keen decided to close the abdominal wound. After the wound had healed injections of a 2 per cent. solution of gelatin and sterile normal salt solutions of 48 c.c. each were made on four occasions between December 4th and 16th. A second operation was then performed, with the intention of wiring the sac and using electricity. On exploring the abdomen the aorta could be readily made out between the stomach and pancreas. As no evidence of atheroma was found in the aortic wall, Keen decided to attempt ligation of the aorta. Four strands of disinfected floss silk were passed by means of an aneurism needle from the left of the aorta to the right, the left forefinger protecting the vena cava from injury. Considerable difficulty was found in disengaging the threads from the eye of the needle. This, however, was finally accomplished. Keen states that in a few minutes after the aorta had been tied the aneurismal sac had shrunk to less than half its original size. The abdomen was flushed with salt solution. The legs, which were cold, were wrapped in cotton and surrounded with hot bags. There was little disturbance in sensation and no impairment of motion. The following day the femoral artery was found to be pulsating slightly. Three weeks after the operation the patient had so much improved that he sat up in bed for two or three days. On January 28th he had a marked chill, with a reactive temperature of 103° F. On January 29th a similar chill. Examination of the blood showed the plasmodium of malaria. The patient continued to fail and died forty-eight hours later. Autopsy showed the abdominal aorta to be entirely cut through at the point where the ligature had passed, just below the diaphragm. From this opening in the vessel blood had filtrated into the tissues beneath the peritoneum. There had evidently also been oozing of blood from the wound at the place where the vessel was tied. The posterior aspect of the aneurismal cavity was found about 3 cm. below the point of ligature.

In addition to this case Keen has given details of 11 other cases reported in the literature, the first being that of Sir Astley Cooper, in 1817, and the last being that of Tillaux, operated upon in January, 1900.

A review of these cases, according to Keen, demonstrates first that the human subject can survive ligation of the aorta without serious mischief. Ten of the 13 cases reported died very shortly after operation, but 3 survived sufficiently long to establish the truth of this proposition. One case survived ten days; Tillaux's, twenty-nine days; one thirteen and one twenty-eight days. Keen believes that these three

cases demonstrate that collateral circulation can be established sufficiently early to preserve the lower limbs from gangrene or paralysis. The second conclusion of Keen is that the treatment of aortic aneurism by temporary compression of the aorta by means of a tourniquet has given excellent results as compared with ligation. Up to 1889, 10 cases have been reported, 5 of which were successful; 4 died. Keen's third conclusion is that in suitable cases of aortic or iliac aneurism the abdomen should be opened and an instrument applied to the aorta which would suitably compress it, without permanently obliterating its calibre. By first making the incision, any injury of the intestine or other organs would be avoided.

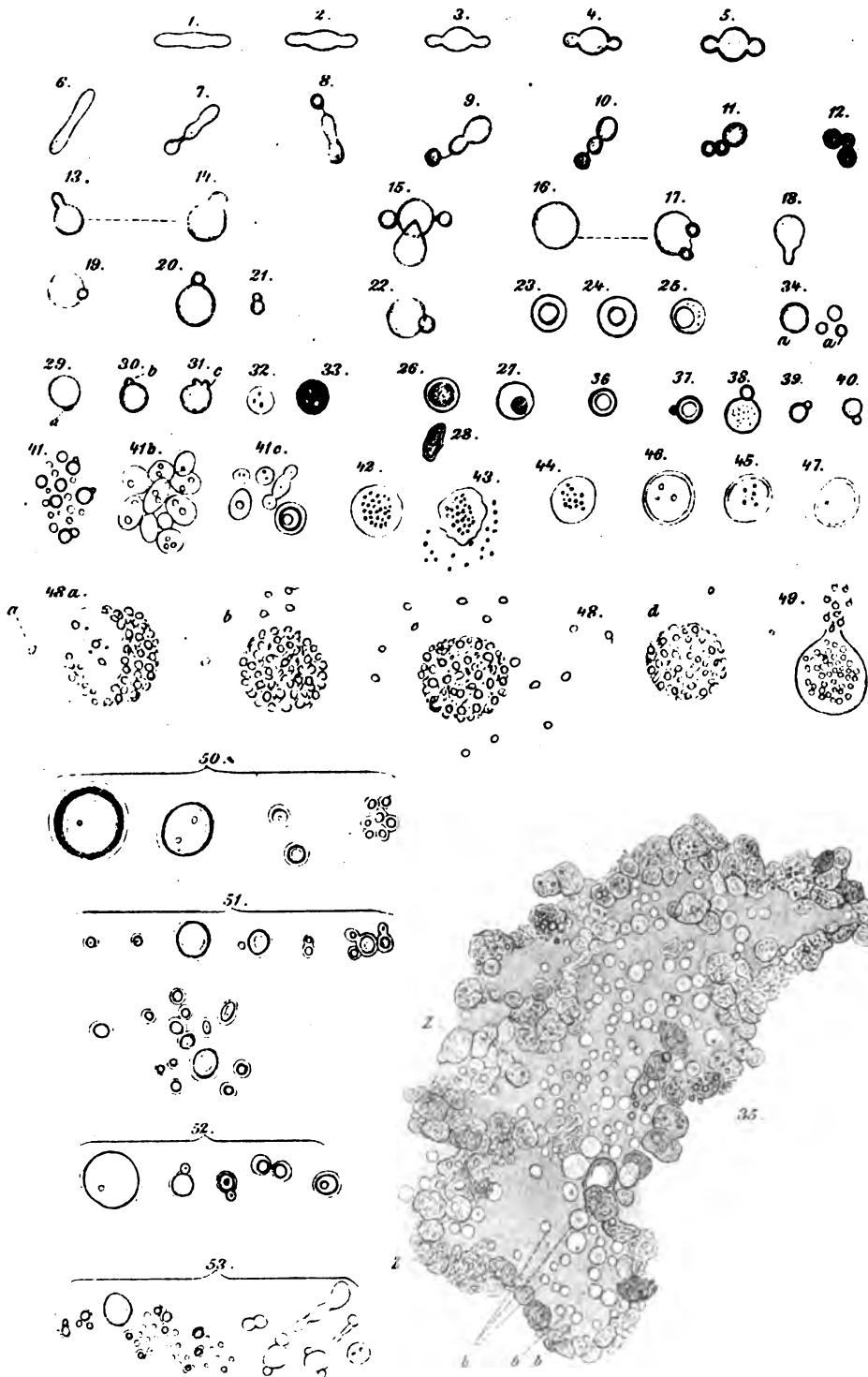
FIG. 56.



The accompanying cut shows the instrument devised by Keen and advocated in the treatment of such a condition.

A careful study of the 13 cases of ligation of the aorta collected by Keen must, I think, make the conservative surgeon hesitate to increase this list. The duration of life in the three so-called successful cases, being only from ten to forty-eight days, seems insufficient to enable one to state positively that either gangrene of the lower limbs or changes in the cord leading to paralysis might not have occurred if the patients had lived longer.

— 10 —



Blastomycetes obtained by Leopold from cancerous tissue. — *Archiv. f. Gynäk.*, vol. lxi.

1 to 14 show the different transformations of the fungi seen in an ovarian cancer. 15 to 21, sporulation of the blastomycetes. 22 to 27, formation of vacuoles. 28, shrunken fungus. 29 to 31, casting off spores. 32, 33, function of granules in cells. 34, variation in sizes of fungi. 35, cancerous tissue from uterus observed for over five months in hanging drop. Z, tissue cells (carcinoma); b, blastomycetes. 36 to 41, sporulation of fungi from ovarian and uterine cancer. 42, spore containing many granules in active movement. 43, escape of granules from cell. 44 to 47, granules have largely escaped. 48 a to d, various groups of granules as seen in active movement. 49, cell from which granules are escaping through a rupture. 50 various forms and transformations of the blastomycetes seen under higher power.

GYNECOLOGY.

By JOHN G. CLARK, M.D.

PARASITIC ORIGIN OF MALIGNANT GROWTHS.

As yet nothing of unquestioned epoch-making value has been discovered concerning the etiology of cancer, although many investigators have indefatigably studied this subject. Of late years the parasitic theory of cancer has been advocated, and Leopold, of Dresden, now believes that he has at last discovered the basal point for this theory. In 1896 he and his assistant, Rosenthal, described cells in carcinomatous tissue which showed independent amoeboid movement. Rosenthal found in fresh carcinomatous tissue, beside the usual fatty granular and hyaline cells, uniformly round bodies filled with yellowish, angular, or oval granules of a glistening appearance. These granules appeared to move about in the cells and to actually escape into the surrounding fluid, where they swam about in the most lively way. This movement was very peculiar, the granules circulating among themselves as if in active ebullition. When not closely crowded together the granules danced about here and there and up and down within the cell cavity. Upon watching these granules for a sufficient time, suddenly, at some spot on the periphery, one would escape, followed soon by others, without the appearance of any break in the cell membrane. This active play of the granules occurred for hours, until, in some instances, the cells would become empty and the surrounding fluid filled with actively swimming granules. At last only the shell of the cell and occasionally the nucleus remained. The inauguration of the movement of the granules varied, sometimes being noted immediately after the preparation of fresh specimens, and sometimes it continued even in blocks of tissue which had been embedded in paraffin for three days. While this phenomenon did not depend upon a definite temperature, it appeared to be most favored by a warmth of 20° to 30° C. Confronted by these most interesting observations, the question naturally arises as to whether these peculiar bodies are a component part of the carcinoma cells or are they veritable parasites. Leopold answers by saying that either some chemical affinity from without produces this movement and escape of the granules or they possess within themselves this motive power. In the latter event they are quite likely to be cocci or parasites in

process of sporulation. At the conclusion of Rosenthal's first report from Leopold's Clinic he left this question in doubt.

Leopold now makes a further communication,¹ having conducted individually since his last report extensive experiments upon this interesting subject. He has obtained pure cultures of blastomycetes from human carcinoma which have been transplanted experimentally into animals and apparently have produced malignant growths from which this organism was again recovered. If Leopold is able to confirm without question these observations it is one of the concluding and one of the great discoveries of nineteenth century medicine.

The article is very interesting and I shall take the liberty of quoting rather extensively from it.

In selecting tissues for examination the ulcerating carcinomata were invariably excluded, and that part of the tumor was usually chosen in which there was most active proliferation. The best material was obtained from the carcinomatous ovaries of a young woman. In order to exclude all extraneous bacteria the most painstaking care was observed in the transference of the tissue into a sterilized receptacle, in the investigation of the tissues in sterilized fluid, in the employment of sterilized utensils and instruments, in disinfecting the hands and surroundings, and in the use of a microscope thermometrically tempered, so as to maintain the tissue in as nearly a living state as possible. In this way microscopic particles were preserved for two hundred days in a hanging-drop of bouillon under the microscope and the existence of the parasite was observed from day to day. For this investigation a special thermostat was constructed in which to maintain the microscope at a uniform temperature. The fresh carcinomatous tissue was studied not only in sterile culture media, but also in macerating fluids, such as dilute hydrochloric and nitric acid and solutions of potassium and sodium salts, so that the cell elements were digested, leaving the parasites unchanged. All of the ordinary culture media were used, the best appearing to be the acid gelatin, which is not liquefied by blastomycetes. In the experimental transplantation large pieces were introduced into the abdominal cavities of rats, guinea-pigs, and rabbits; likewise under the skin of the rat. Animals were also inoculated with pure cultures of blastomycetes obtained from the carcinoma. In the examination of the tissues in the hanging-drop the parasites appeared early. While they usually could be discovered in hardened and stained tissues, in many instances the stains were absolutely ineffective and they could only be detected in fresh tissues.

Cultures were taken only from the interior of the nodes or glands,

¹ Archiv f. Gynäk., 1900, vol. lxi.

every possible precaution, as noted above, being observed to obtain them entirely uncontaminated. Concerning the presence of parasites in pathological growths, Kahane¹ has repeatedly found blastomycetes in fresh sarcomatous tissue. Busse has likewise found blastomycetes, but has not been able to convince himself by culture of the nature of the parasites, although epithelial carcinomata frequently gave yeast-like colonies. Corselli and Frisco² were able to obtain growths of yeast from a sarcoma of the mesentery. Roncali, Gilchrist and Stokes, Plimmer and Petersen, and Exner have likewise obtained similar growths from sarcomatous mammary gland, skin diseases, and carcinoma. In the investigation of twenty carcinomata Leopold has been able to obtain cultures in four cases. From his full details it would appear undoubted that blastomycetes are present in carcinoma; whether they are the specific organisms of carcinoma remains, however, for further proof. Having definitely settled, to his own satisfaction, that carcinomatous tissue contains blastomycetes, and that they may be cultivated upon nutrient media and observed in microscopic sections, he carried his experiment further to determine whether these parasites may be inoculated into animals and produce malignant growths. The following results were obtained from these experiments: First, an atypical new-growth occurred in the lung of a rabbit after fresh human carcinomatous tissue had been injected into the abdominal cavity; second, adenosarcoma occurred in a rat after the injection of cultures of blastomycetes obtained from human carcinoma, death occurring in 195 days. In one instance almost the complete bacteriological evidence required to prove the specific character of the parasites was obtained: First, blastomycetes were found in ovarian carcinoma; second, from this source blastomycetes were cultivated; third, a pure culture of these parasites was injected into the testicles of a rat and subsequently peritoneal nodes developed which caused the death of the animal; fourth, from these nodes blastomycetes were again obtained in pure culture.

To absolutely confirm Leopold's theory and disarm scientific criticism, malignant new-growths must be produced experimentally by the injection of pure cultures. Only by this means will the chain be perfectly completed. While there is yet a considerable loophole in the parasitic origin of malignant growths, we may possibly be on the verge of the final discovery of the etiology of cancer along this line. With this question settled much more rapid strides may be made in the cure of this dreadful disease. As an optimist, I feel certain that a remedy will be found, sooner or later, which will be radically curative. If cancer is of parasitic origin the cure may be greatly simplified, for cer-

¹ *Cent. f. Bakteriolog.*, vol. xviii., p. 616.

² *Ibid.*, p. 368.

tainly some agent is yet to be discovered which will destroy these organisms without jeopardizing the life of the patient. This, so far, has been the chief difficulty, for all germicides of sufficient power to destroy the micro-organisms will likewise destroy vital tissues or lead to general toxæmia and death. On all these points, however, it is very easy to theorize, and to theorize in medicine is usually a waste of time.

CANCER OF THE UTERUS.

One distressing peculiarity of cancer is the terror and deep mental depression which follow its recognition by the patient. This is a marked physiological contrast to the hopefulness and even buoyancy of tuberculous patients, who almost invariably, up to the very last, anticipate a respite or even a cure of their disease. I have rarely seen an individual afflicted with cancer who had the slightest hope of recovery if the disease had passed beyond the operative stage. Even after an operation in which the prognosis is most favorable the patient is continually in fear of a recurrence. The distressing combination of severe physical pain and mental agony constitute a most distressing picture.

In view of the inevitable fatal termination of cancer without surgical intervention it is the physician's and surgeon's duty, even in the face of opposition, not only to advise but to urge operation while the case is curable. Procrastination until symptoms have become urgent is responsible for many deaths annually.

Patients are frequently seen who have passed the menopause, and an interval of months or years may have elapsed without signs of a flow, and then a slight or even a considerable hemorrhage occurs, which patients and even physicians are prone to regard as a recurrence of menstruation, and little attention is paid to it. It is gratifying, however, to note that the general practitioner is recognizing more and more the dangers of delay and is insisting upon an immediate gynecological examination in such cases.

As a result of wide-spread discussion and research in the last two years we are constrained to believe that there has been an advance, although slight, along curative lines.

Both in the United States and on the Continent the recent tendency has been toward the adoption of abdominal methods of hysterectomy in preference to vaginal hysterectomy. This tendency, I believe, is in the right direction, but, as I shall point out, is based upon theoretic rather than practical grounds, for we cannot assert definitely that the abdominal methods result in a larger percentage of ultimate recoveries.

European Views on Cancer of the Uterus. I have always considered Winter, formerly of Berlin, now Professor at Königsberg, most

judicious in his expressions upon this subject. His former papers have been most carefully prepared, and his latest, in which he endeavors to answer the question of whether vaginal hysterectomy is sufficient as a radical method of cure, is replete with valuable information.

In his preliminary statement he says there has been a systematic development in the evolution of operations for cancer of the uterus. First, amputation of the cervix was performed; then came vaginal hysterectomy, and then the various abdominal operations based upon the classic method proposed by Freund, of Strasburg. Along the lines of more radical operations Winter speaks of those of Riess, Rumpf, Mackenrodt, Clark, Veit, and Küstner. In explanation of the abandonment of the vaginal methods, unsatisfactory permanent results are given as the chief cause. The advantage of the radical abdominal operations is that more tissue may be removed in conjunction with the uterus. As a serious disadvantage, the higher mortality following the abdominal operations is given.

Winter's¹ article is stamped with the ear-marks of thorough scientific research and unprejudiced views. His sole purpose seems to be to discover the truth. First, he considers the primary results of vaginal hysterectomy. In this connection he calls attention to the varying rate of mortality in each individual's observations, for in several instances surgeons who have operated upon a long series of cases with a minimum mortality have had, under like conditions, a subsequent series of cases with a high death-rate. Thus, for instance, in the first hundred operations by Hofmeier only seven deaths occurred, while in the following twenty cases six died. Leopold, in his first group, reported a mortality of 7.1 per cent.; in the second group, 2.6 per cent.; and again, in the third group, 7.1 per cent. Winter states that in 1241 cases operated upon by seventeen different operators, up to 1893, there was a mortality of 8 per cent. In the very best hands the average mortality will be 5 per cent., which prompts the statement that even vaginal extirpation is attended by considerable immediate danger. A point which every gynecologist has noted is the higher mortality following the extirpation of the uterus for cancer than even for the more serious inflammatory diseases. Thus Leopold reports a mortality of 5.7 per cent. in cases of cancer of the uterus, whereas he has only had 2.7 per cent. in hysteromyomectomy. Richelot, with a larger number of cases, had a ratio of 10 per cent. in one and 2.6 per cent. in the other; Landau, 7.6 per cent. as against 4 per cent.; Martin 7.7 per cent. against 5.2 per cent.

The cause of the higher mortality following operations for cancer of the uterus is not far to seek, for in almost every case there is more or

¹ *Zeit. f. Geburts. u. Gynäk.*, vol. xliii., p. 509.

less extensive local necrosis, which is conducive to the growth of pyogenic organisms. Regardless of the most painstaking technique these organisms may contaminate the field of operation and cause a serious local or general infection. From my own experience I always assume that, even under the most careful technique, at least 33 per cent. of abdominal wounds will suppurate after abdominal hysterectomy for cancer. Another important point which Winter omits is that these cases are much less resistant to infection than cases of myoma of the uterus in which the general health is quite good, or in inflammatory cases in which the patient has become more or less immune to the local infection. In every case of abdominal hysterectomy for cancer I look with much greater anxiety upon the immediate possibility of septic infection than in any other class of cases.

To eliminate as far as possible this danger of primary infection, the preliminary steps of the hysterectomy are carried out by Winter in a room adjoining the clinic, a separate set of instruments being used. A thorough curettage of the carcinomatous area is performed, rubber gloves being used to protect the hands from infection, and this is followed by a thorough cauterization until the carcinomatous area is entirely burned over and presents the appearance of a black, dry coal.

Permanent Results. After considering the immediate mortality statistics, Winter turns to the permanent results. As a basis he has studied 308 cases in the University of Berlin, gynecological clinic, from which the following table is drawn :

Patients personally examined	157
Patients heard from through their physicians	69
Information obtained from autopsy records	6
Diagnosis as to cause of death obtained from burial certificate	27
Epistolatory information received from patients or their relatives	43
Disappeared and no information could be obtained concerning them	6

A thorough examination was made of those patients who reported personally to Winter, and occasionally ether was administered in order to clear up doubtful points. A thorough general examination was also invariably made for metastatic growths.

As to the time in which recurrences have been discovered, the following table, compiled by Krukenberg, is given :

In the first year, among 200 cases	82 recurrences.
“ second “ “ 88 “	22 “
“ third “ “ 47 “	6 “
“ fourth “ “ 28 “	2 “
“ fifth “ “ 9 “	1 recurrence.

After the fifth year no recurrences were noted.

Of Winter's cases, 148 recurrences were distributed in the following chronological order :

In the first year	.	.	.	.	.	.	.	.	115
" second "	,	.	.	.	.	.	.	.	13
" third "	.	.	.	.	.	.	.	.	13
" fourth "	.	.	.	.	.	.	.	.	5
" fifth "	.	.	.	.	.	.	.	.	2

These tables prove that no statistics are free from error which assume that recurrences do not take place after the third year, for even after the fifth year recurrences have been recorded in several instances. These cases are, however, so extremely rare that a general rule may be stated that any patient who has passed five years without recurrence may be looked upon as permanently cured.

The ultimate results in cancer of the cervix are much worse than in cancer of the fundus, as the following tables will show :

Results in 300 cases of cancer of the cervix.		Results in 30 cases of cancer of the fundus.	
Death immediately following operation	45	Cases free from recurrence	16
Patients not communicated with	14		(53.3-per cent.)
Patients dying of other diseases	11	Cases in which recurrence was noted	14
			(46.6 per cent.)
Total	70		

Of the remaining 230 cases, in which definite results were known, recurrences were noted in 161 cases, 70 per cent., and only 69, or 30 per cent., can be looked upon as permanently cured.

Combining the results of cancer of the cervix and of the fundus shows that there were recurrences in 67 per cent., and in only 33 per cent. was the patient free for five years.

Of the sixty-nine cases in which no recurrence was noted several were living thirteen years after operation.

The statistics show that of all the cases of cancer of the uterus operated upon in the Berlin Gynecological Clinic one-third were cured, while in two-thirds death sooner or later resulted from a continuance or a recurrence of the disease.

In comparison with Winter and Olshausen's statistics the following table has been drawn from the reports of other operators concerning ultimate results :

Cancer of the cervix.	Free from recurrence.	Cancer of the fundus.	Free from recurrence.
Other Berlin clinics	30 per cent.	Berlin clinics (30 cases)	53 per cent.
Leopold	50 "	Leopold (3 cases)	100 "
Landau	22 "	Landau (3 cases)	100 "
Kaltenbach	21 "		

In explanation of the marked difference in the recurrences in various hands it is worthy of note that different principles as to operation have

guided each surgeon. Thus Kaltenbach, whose cases show the largest number of recurrences, operates upon every case in which it is possible to remove the uterus, whereas Leopold exercises the greatest precaution in selecting only those cases in which there is a very favorable chance for complete cure. In favor of Kaltenbach's position it may be said that several cases have been reported in which, notwithstanding the cancer had spread outside of the limits of the operation, the patients remained well for several years. Along this line I recall at least three similar cases in which the gravest prognosis, based upon an accurate microscopical examination, was made as to the continuance of the disease after operation, and yet these patients are living after several years. Unfortunately these are the rarest exceptions to the rule.

After a review of his 308 cases Winter reaches the conclusion that vaginal hysterectomy cannot be considered a radical means of cure, and also that the indication for operation cannot be extended.

After reaching this conclusion Winter systematically reviews the various other methods of operation which have been proposed.

Schuchardt's Paravaginal Incision. In Schuchardt's operation a lateral incision is made from the vagina deep into the paravaginal tissue up to the cervix. This modification of the ordinary vaginal hysterectomy was proposed by Schuchardt to facilitate the more thorough clearing out of the parametrium. The bleeding attending this operation is naturally very free and requires considerable care to control it. These lateral incisions join the circular incision around the cervix, and in this way the tissue between the broad ligaments is more extensively exposed. This operation, while theoretically a better one than the simpler vaginal hysterectomy, has proved unsatisfactory. The thorough clearing of the parametrial space is very likely to lead to more or less serious injury to the ureters. So dangerous, in fact, is the operation in this respect that Winter has usually introduced ureteral catheters before beginning the operation. As an objection to this latter procedure he says traumatic ureteritis may be produced. After a careful review of Schuchardt's operation Winter states that it is more radical than the simple vaginal hysterectomy, but he withholds his opinion as to its value, for as yet there have been too few cases to be of any definite value in reaching ultimate conclusions.

Clamp Method. The principal advantages claimed for the clamp method are more rapid completion of the operation, more perfect hæmostasis, more thorough removal of the diseased ligaments, and the safer removal of an adherent uterus. A chief advocate and one of the first to advise this method was Landau, of Berlin; and, following him, Zweifel and Sänger, of Leipsic; Döderlein, of Tübingen; Burekhard, Schramm, Able, and others. According to Winter, a point in favor

of the clamp method is its rapidity. He, however, takes exception to the statement that the chief advantage of this method is the more certain control of bleeding, and claims that from vomiting and restlessness, deficiencies in instruments and their application, a larger percentage of post-operative hemorrhages have followed this method than the ligature. Winter's experience is an argument against this operation, for in thirty-one cases there occurred four fecal fistulæ, two small vesical fistulæ which healed spontaneously, one larger one which required an operation six months later to close it, and one ureteral fistula which subsequently required extirpation of the kidney. His record is similar to that of others who have exclusively employed this method. The immediate mortality in these cases is shown by the following table :

Landau	121 cases, with 8 deaths.
Zweifel	66 " " 1 death.
Pernice	50 " " 10 deaths.
Winter	31 " " 0 "
Sänger	26 " " 1 death.
Schramm	22 " " 4 deaths.
Able	14 " " 1 death.
Total	330 cases, with 25 deaths.
Mortality	7.5 per cent.

Taking the mortality statistics of the best operators it is seen that the percentage falls considerably below 7.5 per cent. Pernice has had such an extraordinarily large mortality that one cannot resist the thought that his technique has been very poor to say the least. In considering the amount of broad ligament and parametrium which may be removed by the clamp method as compared with the ligature method Winter believes that the former is preferable.

In summing up his opinion of the clamp method Winter says it is to be preferred to the ligature method, first, when it is necessary to rapidly complete the operation ; and, second, when it is difficult or impossible to place ligatures on account of the dense fixation of the uterus.

Transplantation Inoculation in Operations for Cancer. Within the last decade no little stress has been laid by the majority of writers upon the dangers of implanting cancer cells in the wound during operation. Among the first to call attention to this danger was Halstead, in cancer of the breast, and one of the special points insisted upon by him in his operation is that the breast and axillary glands shall be removed in one piece. Great stress was laid upon the same principle in cancer of the uterus by Winter, in his splendid summary of cases published in 1893. This principle has been generally acknowledged by the great majority of operators, and as Winter, in his present article, says, has no doubt been too strongly relied upon to account for local

recurrences after operation. Winter himself acknowledges that since his first article was published his views have changed, and although he still maintains that this is a causative factor in some cases of local recurrences, yet statistics fail to prove it to be as frequent as he anticipated. Certainly enough cases have already been recorded to fully establish Winter's hypothesis; thus, in a number of instances where lateral vaginal incisions have been made, as in Schuchardt's method, local recurrences have been noted in the vaginal wound.

While Winter accepts this as conclusive proof of operative inoculation, Freund quite positively denies this theory and claims that these isolated cases are doubtless instances of the extension of the cancerous process beneath the epithelium. Among the large number of writers who have coincided with Winter are Leopold, Hofmeier, Snger, Von Herff, Olshausen, Rmer, Frommel; Veit, Mackenrodt, and others. As with all novel theories, this has been carried to extremes by some surgeons. Thus, Mackenrodt attributes so many recurrences to this source that Winter is compelled to deny his sweeping assertions. Freund very positively states that detached cancerous tissue cannot give rise to a new-growth when transplanted into fresh wounds, whereas Winter very pertinently alludes to the fact that cancer cells, when carried into even remote parts of the body by the blood or lymph currents, may lodge in organs and give rise to metastatic growths. With this well-known pathological fact before him he quite naturally denies Freund's position. He qualifies his statement, however, by saying that only when the cancerous cells along with the base, or the "mother ground," is transplanted that wound inoculations are likely to occur. He does not credit the statement that detached cells alone are capable of producing this sequel. After following his argument and reviewing his statistics in favor of this theory, I unhesitatingly coincide with Winter and believe, with him, that on no other ground than the inoculation theory can certain recurrences be explained. Some recurrences which are apparently inoculation growths may be looked upon, when we consider the mechanical conditions entering into operations, as a mere continuance of the growth; thus, for instance, in cases in which the parametrium is only slightly diseased there may be a marked retraction of the broad ligament after excision of the uterus. This retraction may be noted during operation, for frequently a uterine artery which is easily caught before the uterus is removed, upon separating its broad ligament attachments retracts and is with difficulty picked up in the deeper lying cellular tissue. In an identical way cancerous tissue, no doubt, retracts along with the broad ligaments after excision of the uterus, and recurrences from this source are noted not about the vaginal incision, but along the iliac vessels. These cases, were we not to take

these facts into consideration, might be looked upon as metastatic or wound inoculations. Likewise, the recurrences which are noted about the rectum, vagina, and bladder may be classed under the same heading. I have been strongly impressed by Winter's theory, and I fear of transplanting the new-growth in this way.

Winter's final conclusions concerning inoculation are as follows: First, inoculation of cancerous tissue into fresh wounds may be accepted as an established fact; second, this factor must play a rôle in the local pelvic recurrences after cancer operations; third, on account of the lack of statistics it is impossible to state the frequency of these recurrences, but, unquestionably, a continuance of the local growth is much more frequent than inoculation growths. To prevent inoculations Winter advised the careful curettage and removal with the scissors and knife of the redundant parts of the cancer, followed by a thorough cauterization immediately preceding the major operation. Notwithstanding these precautions he claims there has been no appreciable decrease in the number of local recurrences. This, naturally, brings up two questions: First, Is there really a local recurrence due to inoculation? second, Are the precautionary measures sufficient to prevent wound inoculation? The first question having been positively answered in the affirmative leaves only the second for discussion.

Mackenrodt, one of the most enthusiastic advocates of the inoculation theory, discards the knife and resorts entirely to the cautery in the excision of cancer. When we consider his statistics in the light of Winter's criticism we are convinced that the results following Mackenrodt's operations do not justify the general adoption of the cautery method. Thus, his immediate mortality is 18 per cent, which is very high as compared with 6 per cent. to 8 per cent. following other operations. Not only does the high immediate mortality following this operation, but still more its untoward sequelæ prejudice us against it. Thus in Mackenrodt's series of cases the ureter was injured in seven cases, or 18 per cent.; the bladder in four cases, or 10 per cent.; the intestine in three cases, or 8 per cent. As Mackenrodt's operation is as yet of comparative recent introduction no definite conclusion can be reached concerning the permanent healing of these cases. In 1897, shortly after Mackenrodt first proposed this method, the principles of which, by the way, had been previously described by Dr. John Byrne, of Brooklyn, to whom little credit is given, I saw him perform the operation in Snger's Clinic in Leipsic. One point insisted upon by Mackenrodt was the bloodless nature of the cautery method; nevertheless, I have seldom seen an operation attended with more continuous hemorrhage. It is unjust to criticise this method after seeing only one operation, and especially when performed under strange conditions; nevertheless, with

as great freedom from bias as possible I am constrained to agree with Winter's adverse judgment.

Vaginal Hysterectomy as a Palliative Operation. In 1895 I accepted the view that even if a curative operation were not possible the patient at least could be made more comfortable during the further extension of the disease by the removal of the uterus. As a result of further experience, however, my views have changed, and I now feel that unless an operation promises a cure it is a serious question whether the patient should be subjected to the danger and pain of a hysterectomy. While the disagreeable discharges and hemorrhages will undoubtedly be stayed for months, or even throughout the remainder of the patient's life, there may be no amelioration of pain, but, on the contrary, it may be aggravated by the retraction of the parametrium and the subsequent growth of the cancer around the sacral plexus. My own view, as previously expressed, was that with the uterus *in situ* the pelvis was more likely to become densely crowded with the cancerous growth, and thus pain would be intensified. When I recall certain cases in which the suffering was most intense, as the result of the retraction of the parametrium and growth of the cancer along the pelvic walls subsequent to operation, I am inclined to accept Winter's statement that the pain is likely to be aggravated rather than relieved by the operation.

If we are to abandon hysterectomy as a palliative operation, what may we substitute for the partial relief of the patient? This question is answered by Sanger, who removes the cervix and adjacent tissue with the Pacquelin cautery. This serves all of the purposes of hysterectomy and no retraction of the parametrium occurs.

Recent American Views on Cancer of the Uterus. At the Atlantic City meeting of the American Medical Association, June, 1900, a number of papers were devoted to the treatment of cancer of the uterus. Among these were the following: "Technique of Vaginal Extirpation for Cancer of the Uterus by Ligature Only," by Rufus B. Hall; "Abdominal *vs.* Vaginal Hysterectomy," by John B. Deaver; "Importance of the Early Recognition of Cancer of the Uterus," by William H. Humiston, of Brooklyn; "Operative Treatment of Cancer of the Uterus," by William R. Pryor, of New York, and a full discussion of the subject by Boldt, Baldy, Carstens, Goelet, Byrne, Bonifield, Engelmann, Clark, Harris,¹ and others.

These papers and the discussion which followed give a comprehensive summary of American views.

In Hall's paper the technical points involved in the extirpation of

¹ Journal of the American Medical Association, 1900.

the uterus by the vagina are rehashed, but nothing of novel value is added. In the cauliflower or sloughing carcinoma Hall prefers to perform the operation in two stages: First thoroughly curetting and cauterizing all of the redundant and superficial tissue and then following in ten days or two weeks with the more radical operation. In this way he avoids the dangers of infection and gives the patient time to recuperate from anæmia incident to the hemorrhage. To curette and follow later with the hysterectomy is a debatable procedure, for, as pointed out by Winter, there is a possibility that in destroying the natural barriers around the carcinoma a wide dissemination may occur through the lymph and bloodvessels. I am inclined to take Hall's position, for I believe that previous to an operation so likely to be attended with shock the patient's general health and strength should be brought to the highest possible point. When the carcinoma is not too wide-spread a thorough curettage may be performed under the effects of a 2 per cent. solution of cocaine. To avoid giving ether twice is a great advantage, because in many cases the general system is more or less depraved and the kidneys are not likely to be in the best functional activity. In some cases, however, this is not possible, both on account of the pain and the dangers of hemorrhage.

Briefly summarized, Hall's technique is as follows:

1. Thorough cauterization and curettage, if necessary.
2. Uterus drawn down by volsellum forceps; vaginal mucosa incised with knife or scissors a half-inch or more from the diseased area and dissected back to the cervix.
3. Bladder dissected away from the uterus; peritoneal opening enlarged by right and left index-fingers, care being taken to push the ureters with the adjacent tissues well out of the way.
4. Incision into the peritoneal cavity.
5. Imbricated ligation of the broad ligament, followed by its detachment.
6. Uterus drawn down outside of the vagina and opposite broad ligament ligated external to the tube and ovary.
7. Continuous ligation closing the peritoneum, leaving a small opening in the centre for the drainage of blood or other fluids.

As a final argument in favor of the ligation method Hall states that a more wide-spread cancerous area may safely be enucleated than by the clamp method, and that the peritoneum can be closed.

I unhesitatingly agree with Hall that of the two methods the ligature is preferable to the clamp.

Deaver, in his paper, strongly favors the abdominal operation. His argument is the same as that offered by numerous other writers, and may be summarized as follows: Lessened danger of injury to the

ureters ; greater chance for a complete extirpation of carcinomatous tissue ; possibility of the removal of the infected lymphatic gland ; less danger of hemorrhage ; post-operative hemorrhage less liable to occur ; less danger of infecting the peritoneum. Under the last heading Deaver says that most cases of abdominal hysterectomy should not be drained ; when, however, drainage is done, it should be supravaginal. The necessity for drainage in any complete case of hysterectomy for cancer is very questionable, for at the completion of the operation there should be nothing left to drain. When the operation has been incomplete and there is extensive oozing, or the cancer has been associated with pelvic inflammatory disease, the drain may be required ; but in such a contingency I cannot agree with Deaver that it should be supravaginal ; on the contrary, a vaginal drain is preferable, for in this way the removal of debris or infectious matter and the control of oozing is more satisfactory, and yet the peritoneal cavity may be closed off securely from the drained area. The indication for vaginal hysterectomy, according to Deaver, is a strict localization of the cancer to the cervix.

How is it possible to determine when the cancer is strictly confined to the cervix ? for it is constantly noted that even in cases which appear most favorable, on account of the apparently complete localization of the cancer to the cervix, a microscopical examination shows the disease has spread beyond the cervical limits ; therefore, I should take a diametrically opposite position to that of Deaver's by holding that this is the class of cases in which the radical abdominal operation is indicated. According to my view, about the only indication for vaginal hysterectomy is found in very fat women. In such cases there is usually a considerable shortening of the distance between the ensiform cartilage and the symphysis pubis, and the ventral wall is very thick, which renders the abdominal operation extremely difficult, and no more extensive removal of the parametrium is accomplished than in vaginal hysterectomy and the mortality is unquestionably higher. As to the indications for the radical operation, I coincide with the statement of Freund, the pioneer in these operations, that invariably the radical operation is to be preferred when the cancer is strictly localized to the cervix.

Humiston, of Cleveland, presented a paper in favor of the early recognition of cancer of the uterus, in which he laid especial stress upon the lymphatic involvement and quoted *in extenso* the careful work of William W. Russell, of Baltimore, on the distribution of the lymphatic glands and vessels of the pelvis. In conclusion, he says it has been his experience that the most common form of cancer of the cervix is the adenocarcinoma, which is by far the most to be dreaded : First, because of its tendency to extend into the parametrium ; second, because the lymphatic vessels and glands of the parametrium are so small

that they may easily be overlooked, and yet may be infected; third, because of the indirect communication with the chain of glands through the iliac vessels. He summarizes the principal points in his paper as follows: First, the early recognition of malignant growths of the cervix; second, careful consideration of the importance of the lymphatic glands and vessels in their capacity as drains for different portions of the uterus; third, abdominal section, with complete removal of these groups of lymphatics, alone offers in suitable cases a chance against the recurrence of carcinoma, particularly when the cervix is affected.

Decidedly the best paper presented at the Atlantic City meeting was that of William R. Pryor, of New York, who based his statements both upon the careful review of his own work and the statistical reports of others. No American surgeon has developed more carefully the technique of vaginal operations than Pryor, and when he takes—as he does in his paper—the most radical position in favor of abdominal hysterectomy for cancer, it is certainly a very strong argument in favor of this operation, for he is amply prepared to judge between the merits of the two methods. In estimating the immediate mortality Pryor has included the statistics in 1087 cases taken from German, French, English, and American operators, in which there was an average mortality of 10 per cent. John Byrne found in 1273 cases a mortality of 14 per cent. The latest statistics by Picque and Maclaure, up to 1889, in 2376 cases gave an average of 9 per cent. mortality. Leopold, Kaltenbach, Landau, Olshausen, and Jacobs in 438 cases had 16 deaths, or 3.65 per cent. The French surgeons Terrier, Doyen, Ségond, Quénu, Richelot, and Bouilly out of 286 cases had 47 deaths, or 16.4 per cent. In this country Gessett, Lewers, Landpher, Purcell, and Russell out of 363 cases had 43 deaths, or 11.8 per cent. As regards the permanent results of vaginal hysterectomy for cancer of the cervix, Gessett for six years had 40 per cent. free; Jarman, for four and a half years, 37.5 per cent.; Longuet, for three years, 14 per cent.; Landpher, for three years, 31 per cent.; Russell, for three years, 41.7 per cent.; Thorn, for six years, 27.5 per cent.; Berry, for two years, 12 per cent.; while Jacobs found that 50 per cent. of his cases relapsed in the first year, the average for 3.9 years being 29.1 per cent. and the average mortality 11.5 per cent.

In vaginal hysterectomy for *cancer of the body* of the uterus Krukenberg, for five years, found 66.7 per cent. free; Lewers, for two years, 83.3 per cent.; Gessett, for six years, 60 per cent.

The difference between vaginal hysterectomy when done for cervical cancer and when performed for cancer of the body of the uterus is strikingly in favor of the latter. The immediate mortality of the two operations is about the same.

Radical Operation for Cancer of the Uterus. In 1895, when I described a more radical method of removing the uterus for cancer, I was strongly convinced of the analogy between the lymphatic involvement in cancer of the breast and cancer of the uterus. The chief point, however, which I insisted upon in that article, and the one which experience has proved the most important, is the wide excision of the locally involved tissue. This principle was based largely upon Russell's excellent study of the after-results in forty-eight cases of vaginal hysterectomy. While at that time I adhered strongly to this principle, I also believed that lymphatic metastasis occurred early. Although the operation proposed at that time was unquestionably more serious than simple vaginal hysterectomy, the mortality following the first twenty or thirty cases was so low as in no way to discourage its general adoption. While sufficient time has not yet passed to permit a definite conclusion as to the ultimate results in these cases, we are convinced that less may be realized from the operation than my first impression seemed to justify. Under the influence of articles by Ries, Rumpf, Freund, Polk, Pryor, and myself there has been a more general tendency to adopt the more radical abdominal methods of hysterectomy. We cannot for one moment countenance any of the local methods of treatment which have been advised, and the only possible method of treatment so far suggested which appears to have any value is that of Dr. John Byrne, of Brooklyn, who uses the cautery quite extensively in these cases.

Wertheim¹ reports twenty-nine cases operated upon during the last two years by a more radical method. His cases furnish a strong corroborative proof of the necessity not only for the wide excision of the uterus, parametrium, and vagina, but also for the careful dissection of the iliac glands. Peiser, whose careful research I called attention to in last year's review, states that in 50 per cent. of cases dying of cancer after operation there were metastases to regionary glands. Winter, on the contrary, claims that glandular metastases seldom occur so long as the cancer is confined to the uterus. Although this statement, according to Wertheim, may in general be true, it is not free from criticism. The general belief that glands which are the seat of metastasis are palpable has been proved by Peiser and Wertheim to be erroneous. The former, from his special research in the Breslau Clinic, claims that a very small proportion of cases of cancer of the uterus fail to show early metastasis. This, I confess, has not been my own observation, nor has it been the experience of Cullen, whose magnificent monograph (*Cancer of the Uterus*) has just appeared. König is likewise skeptical as to early metastasis, for in seven cases in which the glands were removed

¹ Archiv. f. Gynäk., vol. lxvii., Part 3, p. 627.

only two were involved. In criticising these statements Wertheim states that the cancer has been overlooked because isolated rather than serial sections of the glands were studied. In eleven of his twenty-nine cases glandular metastases were discovered. In five of these cases the carcinomatous process was in its very beginning and was only detected in serial sections. In other cases in which the cancer was far advanced no cancerous metastasis was found. This, the author says, is not in accord with the statements of Funke and myself. In four cases the glands were considerably enlarged without the presence of carcinoma (simply glandular hyperplasia). The carcinomatous glands were in several instances easily recognized on macroscopical examination, being of a whitish-gray appearance on section and showing evidence of degeneration. In only three cases of the eleven was the metastasis evident on clinical examination; in the others it was only discovered by microscopical examination. It is impossible, therefore, to palpate all glands which are the seat of carcinomatous changes. This is in accord with my own observations, for very rarely have I been able in operable cases to palpate glandular enlargements. The sensation of infiltration at the base of the broad ligament which may be discovered through vaginal examination is also misleading, for this may be a simple inflammatory change incident to the cancer, but without any trace of metastasis. On the other hand, exactly the opposite may be the case, for a parametrium which is perfectly pliable, and which is apparently normal so far as palpable lesions are concerned, may be the nesting-place of malignant metastases.

One point to which Wertheim especially calls attention is that the glandular hyperplasia is no evidence whatever of carcinomatous metastasis, and only by the microscope may this question definitely be settled. This is a self-evident fact when we remember that regionary glandular enlargements are frequently associated with simple local infections. Therefore we should naturally expect this occurrence in cases of cancer when the lymphatics have for a considerable time perhaps been draining septic matter from the local necrotic area. The general conclusions of Wertheim upon this subject are as follows:

1. In a considerable percentage of cases of cancer of the uterus regionary metastases to the pelvic lymph glands occur early.
2. Even in the very beginning of cancer the glands may be the seat of metastasis.
3. Carcinomatous metastases to the glands are frequently detected only by microscopical examination.
4. The condition of the parametrium, as to whether it is a simple inflammatory or cancerous infiltration, cannot be judged by palpation. Thickened parametrium may be entirely free of cancer, and a parame-

trium which is apparently normal so far as palpable lesions are concerned may be infected.

Following this general statement as to lymphatic metastasis, which is based upon scientific microscopical examinations, Wertheim ventures to hope that some cases of recurrence of carcinoma may in the future be prevented by the more extensive operation. He then states that the abdominal is to be preferred to the vaginal method of operating, and also concurs with me in the opinion that the greatest importance is to be placed upon the removal of a considerable portion of the vagina with the uterus.

Briefly, his method of operation is as follows :

1. The uterus is caught at the fundus with double tenaculum forceps and drawn well up into the abdomen.
2. The separation of the bladder from the uterus and the laying bare of the ureters by dissection.
3. Ligation and division of the round, broad, and sacro-uterine ligaments.
4. Ligation of the uterine artery and the further dissection of the ureters from the parametrium.
5. Lateral excision of the uterus with the adnexa, ligaments, and parametrium down to the vagina.
6. Dissection of the iliac glands.
7. Uterus, with its appendages, pushed down into the pelvis and closed over with peritoneum.
8. Closure of abdominal incision.
9. Extraction of the uterus through the vagina, with the excision of part of the vaginal wall.

From Wertheim's description it appears that his operation is identical with that of Werder, of Pittsburg, which I reviewed in *PROGRESSIVE MEDICINE*, 1900.

One of the chief objections to the radical operation for cancer of the uterus is its long duration and the shock incident to excessive radiation of heat and from the prolonged anæsthesia. This is proved by the fact that of the twenty-nine operations performed by Wertheim nine died within a short time as a result of the immediate results of the operation, and two within two to three weeks. Certainly, only the serious nature of the disease justifies such a grave operation. When we know, however, that the end is invariably fatal unless radically interfered with, and if not operated upon the remainder of their lives will be filled with the most abject and physical and mental misery, we feel that any operation which offers a certain percentage of cures is always justifiable. No patient can stand an operation of two or three hours, even if there is no loss of blood, without considerable shock. Add to this the depressing

effects of even a slight hemorrhage, and fatal shock may supervene. Wertheim has had the same experience as myself, viz., that with increasing practice he has been able to decrease the length of the operation very materially; in fact, he says that some of his later operations have only required one hour and a half for their completion. To save time as much as possible he suggests, where the glands are exposed and are not found to be macroscopically altered in appearance or specially enlarged, they may be left. If they are hypertrophied they must invariably be dissected out most carefully. Notwithstanding my own conviction as to the necessity for the removal of the glands, I cannot ignore the fact that the patient's condition must carefully be considered before proceeding with this concluding step. My own rule is to perform the chief part of the operation first, and if then the patient's general condition is good, the more painstaking dissection of the glands may be undertaken. Notwithstanding the greatest care it is questionable whether we are ever able to remove all the glands, and of late I have frequently made the statement that the histological study of the glands is really of prognostic rather than of real curative value. If the glands are involved, as shown by microscopical examination, we may with assurance predict the return of the cancer. If, on the other hand, the local part of the operation has been complete, and on microscopical examination the glands are found to be free, we have ample reason to give a favorable prognosis. My own principle, therefore, is to lay the chief weight upon the thorough removal of the parametrium and as much of the vagina as possible. The extirpation of the iliac glands is attended with no little danger, for they are frequently found intimately associated with the veins at the point of divergence of the external from the internal iliac vessels. In my own experience I have never seen an injury to these vessels, but, until this part of the operation is completed, I feel that we are on dangerous ground, for at any time a serious accident may occur. Manifestly, should a laceration of the external iliac vessels occur, unless minute, permitting of lateral suture, a fatal hemorrhage or, in case of ligation of the entire vessels, gangrene of the lower extremity would follow. In the event of the laceration of the internal iliac vessel, however, the complication is less grave, for the vessel may safely be ligated. The gravity of the radical operation is such that no man without extensive experience in abdominal surgery should perform it. It is not an operation for the novice, and if it were to be generally performed by untrained men the immediate mortality would far offset any possible benefits accruing from it in more experienced hands. In one case which Wertheim describes the hypogastric branch of the internal iliac vein was lacerated and a very serious hemorrhage occurred. Clamps were finally applied and the vessel ligated, but without com-

plete cessation of bleeding, and a large vaginal and pelvic tampon was required to check it. Severe shock followed the operation, which, however, soon passed off, and the patient made a moderately good convalescence and was able to sit up on the fourteenth day. A few hours afterward, during defecation, a considerable hemorrhage occurred from the vagina, which required another tampon to control it. Two days later a profuse hemorrhage again occurred, and a cotton tampon saturated with sesquichloride of iron solution was inserted and subcutaneous infusions of normal salt solution were given, but all to no purpose, for the patient gradually grew worse and died on the following day. In this case a less experienced operator than Wertheim would doubtless have lost the case on the table.

Wertheim does not advise the insertion of ureteral bougies, for he thinks free dissection may safely be done without this precaution. Perhaps had he adopted this measure he might have avoided a ureteral fistula in one of his cases. From this review of Wertheim's cases we are encouraged to believe that those patients who survive the operation are more certain of permanent cure than by the methods which have been employed in the past.

Notwithstanding the theoretical and scientific proof of the necessity for a more radical operation, I am certain that the most urgent advocate of this theory will be willing to return to the simpler methods if experience definitely proves that it does not give a greater percentage of cures. As yet we are in a transitional state in the treatment of cancer. When we consider the fact that cancer of the uterus in its initial stage is strictly a local process except in rare instances, and does not tend to become diffuse, we may hope that some means of local treatment may be discovered which will cure these cases without the radical operation. Until that time, as conscientious surgeons, we must urgently advise the thorough removal by operation of the cancerous area.

FOREIGN BODIES LEFT IN THE PERITONEAL CAVITY.

In a previous number of *PROGRESSIVE MEDICINE* I called attention to the frequency of this accident and detailed several instances in which foreign bodies were left in the peritoneal cavity. Neugebauer,¹ who is one of the most indefatigable statisticians among the Germans, has collected from the literature 101 cases in which artery forceps, sponges, gauze, and other foreign bodies have been overlooked. Each case is given more or less in detail, his article comprising some twenty or more pages. Some of the cases are most interesting. In his summary

¹ *Monat. f. Gynäk. u. Geburts.*, 1900, vol. xi., No. 4.

the fate of the cases is detailed as follows: In 19 cases in which artery forceps were left behind 6 died almost immediately after the operation of sepsis; 1 after a second operation performed some months later for the removal of the foreign body. In 3 cases the forceps were expelled spontaneously per anum—1 four years, 1 nine months, and 1 ten months after the operation. In 1 case the forceps worked through into the bladder and in 2 cases were discharged through abscesses in the abdominal wall. In 1 case the artery forceps were found in Douglas' cul-de-sac before closure of the abdominal wound. In 2 cases the loss of the forceps was noted immediately after the closure of the wound, and were recovered before the patient was removed from the operating-table. In 4 cases a subsequent abdominal section was required for their recovery—1 six months, 1 several months, 1 two years, and 1 three and a half months after operation.

The fate of the cases in which sponges were left behind was as follows: In 19 cases they were discovered at autopsy. In 2 cases the sponges were missed before the closure of the abdominal wound and were found, and in 3 cases the abdominal wound was reopened before the patient left the table. In 3 cases the abdomen was reopened twice in twenty-four hours and once four days after the operation. In 1 case the sponge was discharged over five months later through an abscess in the abdominal wall. In 1 case the sponge was discharged piecemeal through an abdominal fistula one and a half years after the operation.

In 4 cases drainage-tubes were left behind, in 1 case being recovered by abdominal section four days later. In 1 case the tube was discharged through the vagina a long time after the operation, falling upon the ball-room floor while the patient was dancing. In another case it was found at autopsy two years after the original operation, and in the fourth case it was discharged by rectum two weeks after the operation.

In 31 cases pieces of gauze were left behind. Death occurred in 7. The gauze was discharged by rectum in 10 cases, the time varying from two days to twelve years after the operation. In 4 cases a second abdominal section was required for the recovery of the gauze. The remainder were discharged through intestinal fistulæ and in one instance through the prevesicle space. In another case it was recovered by vaginal hysterectomy. In another it was discharged by the vagina, and in two instances, although the gauze was known to be in the abdominal cavity, it was left in the hope that it would discharge spontaneously through suppuration.

These statistics speak for themselves, and further comment is unnecessary. These accidents must, however, impress more strongly upon every operator the necessity for the most painstaking care in counting

and keeping constant oversight of the number of sponges and smaller instruments used during an operation.

HÆMATOCELE.

Winternitz¹ has extensively studied the etiology, pathology, symptomatology, and treatment of pelvic hæmatocele in women. It is interesting to note that within the last decade there has been a considerable change in opinion as to the cause of hæmatocele. As formerly used, this term meant an encapsulated collection of blood in the pelvis. In the further investigation of these cases, however, it was found that hæmatocele very rarely occurs from other causes than ectopic pregnancy, consequently such a collection of blood is now usually looked upon as diagnostic of this anomaly. This view cannot be accepted without reservation, for every operator of experience occasionally sees cases which are of other origin.

In a previous volume of *PROGRESSIVE MEDICINE* I called attention to an interesting case reported by Bovée, of Washington, of hæmatocele resulting from simple hemorrhage without ectopic pregnancy. Excluding ectopic pregnancy the common causes, according to Winternitz, are atypical menstruation, inflammatory disease of the Fallopian tube, varicose veins of the broad ligament, malignant tumors of the genital organs, pressure produced by pessaries, etc.

The old theory of Schröder as to the formation of blood-clots in pre-formed cavities is no longer sustained by clinical and pathological evidence. Veit's theory as to pelvic peritonitis being a frequent etiological factor is also abandoned. Pain, according to Winternitz, arises from the local peritonitis and the adhesion between the encapsulated hæmatocele and the surrounding parts. The uterine bleeding is due to the exfoliation of uterine decidua. According to Thorn's views, deficient involution of the uterus from compression of the tumor also may lead to hemorrhage. According to Winternitz's statistics tubal abortion is much more frequently the cause of a hæmatocele than rupture of the tube.

In order to make as perfect a diagnosis as possible special stress is laid upon the necessity for a rectal examination. Pathological conditions from which hæmatocele is to be differentiated are retroflexed gravid incarcerated uterus, broad ligament exudates, ovarian tumors, tubal pregnancy with a living ovum, etc. By way of treatment he advises the expectant plan, although absorption may be prolonged.

¹ Veit's *Handbuch der Gynäk.* vol. cxi., Part 22. Abstract, Stockel, *Centralbl. f. Gynäk.*, 1899, No. 32.

The danger also of these collections of blood becoming infected must always be kept in mind. In the expectant plan of treatment absolute rest in bed is necessary, and in cases in which this is not possible, as in poor women, operation may be advisable. Vaginal puncture is absolutely discarded by Winternitz. An incision through the posterior vaginal vault is only advised when the hæmatocele is very large, and is not dependent upon tubal abortion or when the general condition of the patient is so serious that cœliotomy is absolutely contraindicated; also in cases where suppuration of the blood-clot is suspected this course is deemed advisable; in all other cases cœliotomy is to be preferred. If the bleeding is not controlled by ligature a Mikulicz tampon is advised. If the adnexa of the opposite side are diseased they must be removed at the same time. Pelvic massage is dangerous and should not be employed.

In general I am in accord with the statement of Winternitz concerning the etiology of hæmatocele, and I feel assured that in a careful study of all cases in which ectopic pregnancy is supposed to be the causative factor a considerable number of such collections arising from other causes than extra-uterine pregnancy will be discovered. As to discarding vaginal puncture and incision, I cannot agree with the writer, for in a considerable series of cases of hæmatocele, where the blood has been well encapsulated and collected in Douglas' cul-de-sac, I have seen most satisfactory results following the simple incision and thorough washing out of the sac. Even theoretically I see no objection to this method. A hæmatocele of sufficient standing to be encapsulated becomes an extraperitoneal collection, and the peritoneal cavity is therefore not invaded if it is incised through the vagina. I have treated many cases in this way, and have yet to regret this course. The chief point to be considered always in the vaginal incision is whether the blood is encapsulated. If free, as soon after a profuse hemorrhage or where the extra-uterine foetus is still in a growing state, manifestly cœliotomy is necessary in order to thoroughly clear out the clotted blood and to stop the further growth of the foetus by the removal of the Fallopian tube.

SPINAL ANÆSTHESIA.

After the inauguration of a questionable surgical procedure, such as spinal anæsthesia, the more conservative members of the medical profession are inclined to look at it askance until it is proved to be safe and efficient. Already a large number of cases have been reported from various sources in which its advantages have been lauded or its disadvantages enlarged upon and its employment decried. In view of the

fact that ether narcosis, when properly conducted, is so infrequently harmful, it must be very definitely proved that cocaineization of the spinal cord is almost entirely free from danger before it can be accepted as a justifiable anæsthetic.

Marx¹ has reported his failures and successes in the use of this form of anæsthesia. He has performed in the neighborhood of one hundred punctures with two failures, both of which occurred in intensely neurotic women. In injecting the cocaine the patient sits inclined forward (scorching position), and the thumb of the surgeon's left hand is placed on the spinous process of the fifth lumbar vertebra. The needle is then inserted in front and over the edge of the thumb, the direction being from above down and from without in. In the event of the lamina interfering the needle-point is moved gently up and down until it no longer meets resistance, and is then gently pushed in until a clear, limpid fluid escapes. The syringe is then attached to the needle and the cocaine is injected. Eight to fifteen minims of a 2 per cent. solution are injected, the needle being held in place until the cocaine becomes diffused in the spinal fluid. On withdrawal of the needle the puncture is sealed. Before anæsthesia is noted there is a period of hyperæsthesia, accompanied by trembling of the limbs and a feeling of formication over the affected area. Vomiting may occur, but is usually evanescent. According to Marx's clinical experience, the time and area of the anæsthesia differs considerably and is influenced neither by the dose nor the force with which the cocaine is injected. His theory has been that the rapidity and the extent of the anæsthesia depend upon the rapidity of absorption or the susceptibility of the patient, but he is now inclined to concur with Tait and Caglieri, who believe that the extent and the rapidity of the diffusion are influenced by the amount, composition, and density of the liquid, but particularly by the pressure under which the cocaine is injected. These experimenters believe that untoward post-operative symptoms may be due to disturbances in the equilibrium of the subarachnoid fluid and that it can be obviated by the withdrawal of a small amount of the fluid followed by slow injection of the cocaine. Some of the conclusions of Tait and Caglieri upon this point are as follows :

1. To the lumbar route they propose to add the "low cervical" in the sixth cervical space, both easy and safe.
2. Direct intramedullary medication is feasible and deserving of further trial.
3. Subarachnoid injections are devoid of danger if made with certain precautions. The solution should be freshly prepared and injected

¹ American Journal of Obstetrics, January, 1901.

slowly at a temperature of 37° C., and never in greater amount than 3 c.cm.

4. The extent and duration of the analgesia thus induced are generally in direct proportion to the amount of the drug injected. Analgesia is noted in some cases as early as five minutes after the injection and in others, for unknown reasons, as late as thirty-five minutes. Its duration is sufficient for the performance of all operations on the lower limbs and pelvis, and may be of service in obstetrics.

5. The disagreeable effects sometimes noticed are partly due to the increase of pressure in the subarachnoid space, to too rapid diffusion toward the brain, and principally to the amount of cocaine used. These post-operative symptoms are never alarming or lasting. They recall the intradermatic effects of cocaine, and never resemble in severity the symptoms so frequently observed during or after chloroform or ether anæsthesia.

6. One cubic centimetre of a 1 per cent. solution of cocaine, injected slowly, is generally sufficient for all practical purposes and has not been followed by untoward results.

7. For obvious reasons it is a good plan to withdraw a small amount of cerebro-spinal fluid prior to making the injection.

Causes of Failure. A very potent factor in making an otherwise good narcosis a failure is noise, bustle, and excitement during the operation. To prevent this he obtunds their otherwise markedly increased powers of sight and hearing, preferably by plugging the ears and blindfolding the eyes. To prevent or alleviate the post-operative symptoms bromides are given in large doses, 30 to 40 grains one or two hours before the operation. These patients should be operated upon, if possible, when their stomachs are empty. When the post-operative symptoms are persistent and not relieved by the bromides he considers hyoscine hydrobromate, in doses of $\frac{1}{200}$ of a grain, of considerable value. When cyanosis or dyspnœa become apparent nitroglycerin is used.

As a result of the use of cocaine in forty-two cases of labor he claims to have had satisfactory results except in one case, in which $\frac{1}{6}$ of a grain of morphine was administered with the cocaine. In this case symptoms of morphine poisoning developed and required heroic measures to relieve the patient. As a result of his observation Marx gives the following possible causes of failure :

1. Inert cocaine solution. Repeated sterilization spoils the cocaine ; it should not be boiled more than once, and the solution should be freshly prepared for each patient.

2. Too little of the drug used. This is a factor that can never be gauged. In obstetrics between $\frac{1}{4}$ and $\frac{1}{2}$ of a grain is sufficient.

3. An imperfect syringe. With an imperfect syringe backing of the solution behind the piston would cause the fluid to be ejected instead of injected.

4. Idiosyncrasy. This is a condition which can never be foretold. It is especially associated with highly nervous and hysterical patients.

5. Faulty technique. The largest number of failures are due to non-entrance into the canal, and are due to (a) faulty technique, or (b) a too short needle, or (c) a very dull needle-point which pushes the membranes before it, or (d) a very large calibre needle which makes inordinately large apertures and predisposes to extravasation of the fluid, or (e) disturbance of the relation of the needle-point to the canal while screwing or fixing on the barrel.

The injection of the cocaine is carried out with the strictest antiseptic and aseptic precautions.

In the discussion of Marx's paper before the New York Obstetrical Society, Brothers was inclined to take a conservative position, claiming that the advantages of the new method are limited and that as yet it cannot replace the older methods of anæsthesia. In a further discussion of this paper, Gibb, Austin Flint, Jr., McLean, and Boldt reported favorable and unfavorable cases. As yet I have not tried this method of anæsthesia, for it is very rarely that one meets with a case that will not stand ether, when properly given, with perfect safety. A serious objection to the new method is that when once the cocaine is injected into the spinal canal its action is beyond control. A few years back the surgical world grew most enthusiastic over the administration of ether by the rectum, for this appeared to be an ideal method, for it obviated the chief difficulties of the inhalation method. Practically it proved to be most disastrous.

As with all new measures, therefore, I feel that those who desire to be upon the safe side should hesitate to employ spinal cocainization until its field of usefulness, its dangers, and its post-operative results are definitely defined.

ENTEROPTOSIS.

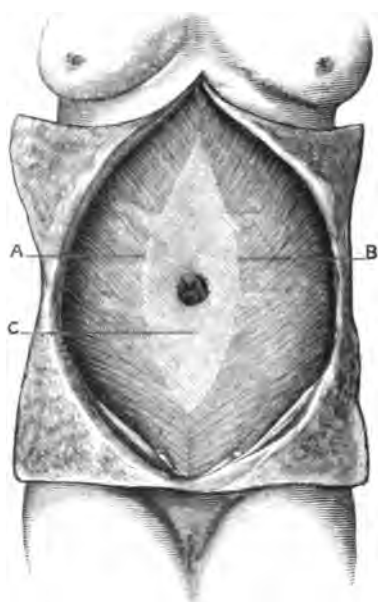
The general practitioner, as well as the gynecologist, is frequently consulted by patients who suffer with intense backache, pain in one or both renal regions, general dragging sensations in the abdomen, nervousness, and dyspeptic symptoms frequently accompanied by the dragging sensations and sacral backache incident to a relaxation of the pelvic floor. Notwithstanding the careful repair of the latter injury, with possibly the restoration of the uterus to its normal position by ventrosuspension or Alexander's operation, these patients continue to suffer

more or less from general neurasthenic or dyspeptic symptoms. The greater becomes one's experience with nervous cases the more must one be convinced that a definite physical cause is frequently the basis for their symptoms. Correct the physical defect and the nervous disturbances cease. To classify the ill-defined cases under the term "neurasthenia" is simply to cloak our ignorance with a vague name. Frequently, notwithstanding the greatest care in following the history of a case, with the minute examination of every possible organ which may give rise to local irritation, no sufficient lesion is found to explain the symptoms. Unquestionably a definite proportion—how large or how small one cannot say—are purely of the nervous type and are subject to intense fear or anticipation of impending physical collapse. These cases, of course, require no treatment of any sort further than the elimination of their nervous dread, which frequently comes after their confidence is thoroughly established as to the possibility of a cure. This class of cases frequently drifts from office to office without obtaining relief, because local therapeutic measures are relied upon. When, at last, they become thoroughly discouraged and, grasping at a straw, take up one of the fads of the day, such as osteopathy, Christian science, or some of the other popular fallacies, their imaginative ills are cured. Further on, under the title "The Diagnostic Value of Pain in Gynecology," I have fully reviewed Somer's very instructive paper, which deals most thoroughly with the nervous type of cases so frequently seen by the gynecologist. The purely nervous cases should carefully be differentiated from those in whom there is a definite physical basis for their nervous upheaval. Cases of enteroptosis belong to the latter class. On physical examination the abdominal wall is lax; there is more or less diastasis of the recti muscles, permitting between them deep digital indentation. There is marked sagging forward of the anterior abdominal wall when the patient stands, and as a result of this failure of support the liver, kidneys, and in fact all of the abdominal viscera tend to drop downward and forward, thus putting their suspensory attachments and ligaments upon a continuous stretch. To overlook such lesions means that the patient must continue to suffer. To correct this in part, restoration of the relaxed pelvic floor may give relief, but it will be only partial, for the patient may still suffer with many of the symptoms incident to the continuous dragging upon the supporting attachments of the abdominal viscera. In the past the usual treatment for enteroptosis has been a supporting bandage, with massage of the abdominal walls, in the hope that the tonicity of the overstretched muscles and fascia might be restored and thus overcome the general relaxation. It is claimed by many writers that when the muscle is once overstretched and has become more or less atrophied there is no possibility of its returning to the normal.

Glenard first called attention, in 1885, to enteroptosis, which he found more frequent in women, and claimed that it was responsible for many of their nervous and reflex symptoms.

J. Clarence Webster, of Chicago, has recently offered a very valuable contribution to this subject in the line of treatment. As to whether the relaxation of the abdominal wall is due to overstretching of the fascia or the muscle is still a question. Webster concludes from his investigations that a general laxity or weakness of the muscles and fascia is rare, and that in most cases enteroptosis results from a sepa-

FIG. 57.



Dissection of anterior abdominal wall in a multipara, with diastasis of the recti muscles. A. Inner edge of right rectus. B. Inner edge of left rectus. C. Linea alba stretched and thinned. For schematic representation, see Fig. 58.

FIG. 58.



In this scheme the abnormal separation of the recti muscles is shown, which permits a hernia-like projection forward of the viscera.

ration of the recti muscles and extensive stretching of the linea alba. This alteration exists in a more or less marked degree in many women who have borne children, and is an important cause of their ill health. Webster calls attention to the fact that the significance of these lesions is in general overlooked in the practice of medicine. In the least marked cases the weakened area is found around the umbilicus; but in the more marked stages the entire central line from the symphysis to the ensiform cartilage may become attenuated (Figs. 57 and 58).

As a rule, the greater the thinning of the linea alba the more extensive the enteroptosis. Sometimes this fascia is so overstretched that it is impossible to dissect any extensive portion of it as a

distinct layer. Coincident with the stretching of the linea alba the recti muscles become separated, and in extreme cases an interval of five or six inches may exist between the edges. Webster has not found a single case of pendulous belly in the last two years in which these conditions were not present, and in no instance was there any general stretching of the abdominal wall unaccompanied by a wide separation of the recti muscles.

Etiology. As an etiological factor, Webster lays especial stress upon frequent childbearing. Since he has turned his attention especially to the consideration of this subject he has become convinced that in the great majority of women there is some degree of separation of the recti in the region of the navel as the result of the distentions of pregnancy. In many instances this condition is promptly overcome after labor through the normal retractibility of the abdominal wall. If, however, pregnancies occur in rapid succession, permanent widening and stretching of the linea alba is likely to occur. A prominent factor in the development of this diastasis is hard work, especially lifting or carrying heavy weights in the second half of pregnancy. Sometimes a sudden strain or fall, the wearing of corsets during pregnancy, flatulence or constipation, abundant adipose tissue of the mesentery or omentum are favoring causes; likewise excessive coughing or vomiting during pregnancy may lead to a diastasis. Subsequent to labor the most important causes are tight-lacing in one class of women and too early hard work in another. Given a diastasis which has resulted during pregnancy with these conditions following, it will usually become a permanent disability. As a proof that pregnancy is a chief cause of this diastasis, Webster says he has never found an extreme case among nulliparous women. The first organ to undergo descensus is usually the right kidney. In several instances where Webster has performed abdominal section for pelvic troubles he has found the transverse colon and sometimes the stomach lower than normal, whereas by external examination he has been able to distinguish only a prolapsus of the right kidney. When marked stretching of the linea alba takes place a descensus of the viscera occurs as a result of the tugging upon their attachments. Mobility of the left kidney is by no means so frequent as the right. The abdominal walls between the recti muscles become thin and, in extreme cases, the recti themselves are pushed far out from the median line until they appear as semilunar ridges from sternum to pubis.

Symptomatology. The symptoms of this form of hernia, for it may be looked upon as nothing less, are dragging in the back and abdomen, aggravated by long standing, walking, or working, and sometimes general weakness. Pains in the iliac, lumbar, or other regions are frequently complained of; the bowels are often constipated, and various dyspeptic symptoms may be noted. Pulsation of the aorta may be so distinct as to disturb the patient, causing her to fear some very serious disease. The patient is frequently subject to nausea and vomiting, loses weight, and finally becomes profoundly neurasthenic. All of these symptoms may be more or less combined in one case or one complaint may predominate. In the event of only slight attenuation of the linea alba there may be no symptoms. If there be associated with the weakened

abdominal wall tight-lacing, the conditions for dislocation of the liver and kidneys are generally increased.

Diagnosis. Webster finds the diagnosis of these cases easy. He suggests a manœuvre which is unquestionably of value for determining the extent of the diastasis. With the patient in a recumbent posture, the physician places the finger-tips of his right hand over the linea alba near the umbilicus; with his left he grasps the patient's hands and she is asked to raise the head and chest somewhat from the table, in order to contract the recti muscles. As the muscles shorten they tend, if the linea alba is not overstretched, to approach the mid-line. Through the sense of resistance the physician may determine the extent of their separation (Fig. 59). This manœuvre is frequently

FIG. 59.



Marked separation of recti muscles. The fist is buried in the gap between the separated muscles.

unnecessary, because the diastasis is so evident that the diagnosis can be made without question. In some instances the vertebra can be felt with the greatest ease, and the pulsations of the aorta are frequently visible. Frequently a groove exists along the mid-line of the abdomen, and when the patient contracts the abdominal muscles this part of the wall bulges forward. Webster states that where the recti muscles are pushed far out laterally palpation of the lumbar region may lead the physician to diagnosticate prolapsed kidney, or some other swelling, when the tumor-like mass is only a displaced rectus muscle.

Treatment. After thus carefully going into the etiology and diagnosis of this condition, Webster considers its treatment. Frequently the symptoms disappear almost immediately after the patient ceases to wear corsets and suspends the skirts from a loose waist or from the

shoulders. This relief may be noticed even when there is considerable displacement of the right kidney. If there has been considerable atrophy of the muscle, as the result of wearing corsets or tight skirt-bands, massage may be of value. In the majority of cases, however, other means are necessary to relieve the patient. First, a silk elastic abdominal binder, which serves as an indirect support for the abdominal viscera, should be tried. As an objection to the use of the binder

FIG. 60.

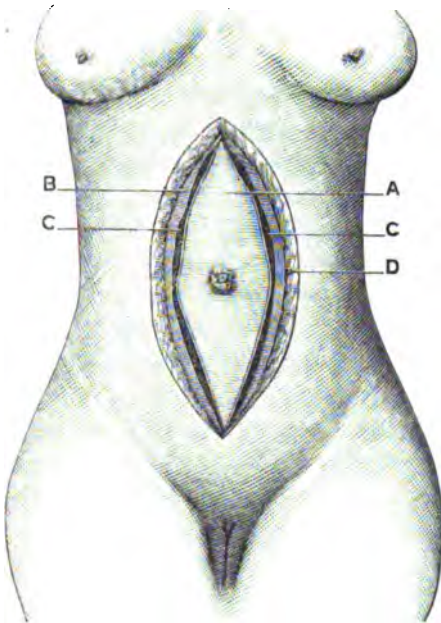


FIG. 61.

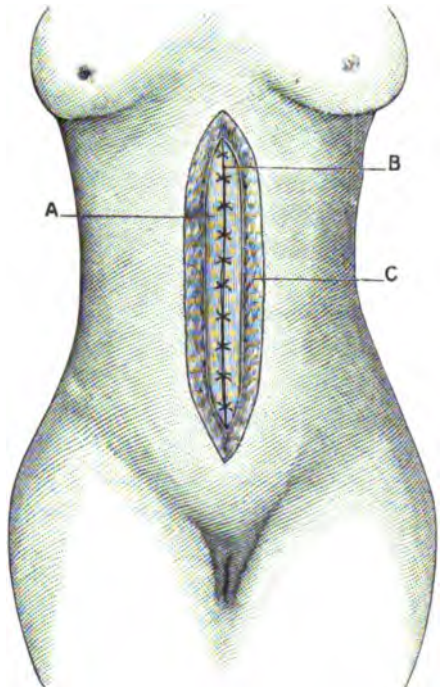


FIG. 60.—Operation for repair of weakened abdominal wall. The drawing represents the inner edges of the separated recti muscles exposed. A. Stretched and thinned linea alba. B. Anterior layer of sheath of rectus. C. Edge of rectus muscle exposed by opening sheath. D. Skin and subcutaneous tissue.

FIG. 61.—The drawing represents the recti muscles with the fascia covering them drawn together and sutured by strong linen. A. Fascia forming anterior sheath layers of rectus. B. Line of juncture of the muscles and sheaths. C. Skin and subcutaneous tissue.

Webster offers the following: "It must be worn continually, resulting inevitably in atrophy and weakening of many of the trunk muscles; it is unpleasant to the wearer, especially in hot weather; it has to be renewed at intervals of a few months, a serious consideration for a poor woman; it is least effective and most quickly gets worn when the patient engages in daily work." On this account Webster has introduced the following operation:

An incision is made in the middle line of the abdomen, the length depending upon the separation of the muscle, dividing the skin and subcutaneous fat until the linea alba is reached. The umbilicus may or may not be excised, depending upon the opinion of the operator. The skin and fat are carefully dissected off from the fascia on both sides of the middle line until the edge of each rectus is reached. The sheath of each rectus muscle is then split open from the lower to the upper angle of the wound and the muscles are loosened from their internal fascial attachments (Fig. 60). A series of strong, interrupted silk sutures are passed from side to side through each muscle and its corresponding anterior sheath layer, bringing the muscles into close apposition. Cat-gut may be used to complete the perfect approximation of the borders of the fascia (Fig. 61). The overlying fat and skin are then closed, according to the will of the operator. After the sutures are tied there may be a considerable bulging of the skin along the line of the incision. These prominences, however, usually disappear with the retraction of the skin during convalescence. In some instances Webster has removed a strip of the skin and fat from each side of the wound before its closure. He has operated upon 51 cases, and states that the results have been most satisfactory. In two instances a slight infection along the stitches occurred, but the healing was not essentially interfered with. In less than 8 per cent. of the cases nephrorrhaphy was performed. In 55 per cent. retroversion or prolapse of the uterus was present and was treated by operative measures. The operation has always been followed by improvement and in some cases by complete cure. Those patients who are greatly run down and marked neurasthenics usually recover health very slowly. After the operation corsets should be abandoned and the skirts should be hung from the shoulders. For at least six months all heavy exercises should be enjoined, and a silk elastic binder should be worn for this time. During the early convalescence massage of the abdominal walls is advisable, and, following this, light gymnastic exercises calculated to improve the abdominal muscles may be of great value.

From Webster's article we judge that he only employs this means of curing enteroptosis in the more extreme cases. His advice is commendable, for certainly in those cases where there is marked overstretching of the linea alba, with separation of the recti muscles, at most only temporary relief is afforded by the wearing of bandages. A permanent cure cannot be hoped for by this means. Certainly where there is only slight separation of these muscles operation should not be considered until all the ordinary means of cure have been exhausted. In many instances massage and exercise are unquestionably beneficial in restoring the tone of the muscular structure. That this means is of

value in actually causing the retraction of the overstretched fascia is most questionable. In fact, I do not believe that overstretched connective tissue, especially in women who have borne a number of children, ever returns to its normal tensility.

The operation which Webster has described and which he supports by a report of fifty-one cases appears to me to be well worthy of trial, and in the more exaggerated cases of enteroptosis I shall certainly employ it.

NON-MALIGNANT RECTAL STRICTURE.

Reuben Peterson¹ quotes several compilers as to the relative frequency of acquired non-malignant stricture of the rectum in the male and female. It is well proved by these statistical studies that the disease is more frequent in the female, the ratio having been variously reported as 9 to 1 (Cripps), 7 to 1 (Juliusburger), 5 to 1 (Allingham), 4 to 1 (Gosslin and Dunbar, Carre, Gant), and 2 to 1 (Quénu and Hartman).

He classifies rectal stenoses under two heads :

1. Those due to pressure from without the rectal walls (here organic changes in the bowel are secondary).
2. Those where the rectal coats are primarily affected, the organic changes occurring in them accounting for the stricture.

As for the first division, any tumor which occupies the pelvis may press upon the rectum and hinder to an extent its function. It is rare, however, for a benign growth acting simply through its juxtaposition to cause a complete obstruction of the rectum unless it is bound firmly against that viscus by adhesions. Inflamed and adherent appendages must also be included as factors in the production of this sort of rectal stenosis.

The second class of cases—those resulting from organic changes primarily affecting the rectal walls—are all the ultimate result of inflammatory changes beginning in the rectal walls and leading to the formation of new connective tissue, which contracts and narrows the lumen of the gut. The initial inflammation may be ascribed to trauma, dysentery, gonorrhœa, tuberculosis, and syphilis.

Trauma. It is beyond cavil that injury to the rectal mucosa sufficient to produce loss of substance and ulceration may result in stricture. Among the examples of this are the introduction of foreign bodies into the rectum (doubtful), protracted labors (probably through rectovaginal fistulæ or a perirectal inflammation superinduced by puerperal sepsis),

¹ Etiology of Non-malignant Rectal Stricture in Women. Journ. Amer. Med. Assoc., February 3, 1900.

failure of primary union in operations involving the rectal mucosa, and unskilful operations in which too much tissue has been removed.

Dysentery. The frequency of this as an exciting cause has been exaggerated. Well-authenticated cases, however, have occurred. It has been demonstrated post-mortem that dysenteric ulcers may invade the submucosa and muscularis of the bowel. If this is true then a stricture might follow either from the dysenteric ulcers themselves or these might serve as points of entrance for other infections, which in turn might lead to connective-tissue hyperplasia and cicatrization. But not every case of rectal stenosis with a diarrhoea of mucus, pus, and blood is dysenteric. Indeed, Woodward records that no case of rectal stenosis following dysentery has ever been reported to the Surgeon-General either during the war or since, and the author in a four years' service as a pension examining surgeon never saw such a case.

Gonorrhœa. Bear's statistics show that of 429 cases of gonorrhœa in women, rectal involvement was noted in 38.2 per cent.

While the gonococcus produces for the most part a surface inflammation, it has been shown, heretofore, that the underlying tissues may also be involved and the seat of round-cell infiltration, connective tissue hyperplasia, and subsequent contraction.

This occurs in a certain number of cases and may produce a stenosis, but we are not justified in presuming that in this lies the *raison d'être* for the comparative frequency of the affection in women.

Tuberculosis. Ball calls attention to the fact that a considerable proportion of individuals afflicted with stricture of the rectum die of phthisis, and thinks "this tends to show that in all probability a larger number of cases have really commenced in rectal tuberculosis than has heretofore been recognized."

Sourdille first demonstrated tubercular stenosis of the rectum. He did this not only by histological examination of a portion of the stricture which had been excised, but also by inoculation. Later on he published seven cases and reviewed the literature upon the subject, giving it as his opinion that one-quarter to one-third of the cases commonly supposed syphilitic were tubercular. This in Peterson's opinion is over-estimation, but it serves to emphasize its importance as an etiological factor.

Sourdille discovered that the tubercular affection might not be manifested alone by ulceration of the rectal mucosa, but by infiltration of the submucosa with sclerosis and contraction as well.

Syphilis. It cannot be denied that a relatively large proportion of persons afflicted with rectal stenosis give a syphilitic history. This proportion, according to the researches of Poelchen, Juliusburger, and Godebert, reaches 66 per cent. Gosslin was the first to deny that all

strictures of the rectum were syphilitic in origin. He believed that the stricture when syphilitic was a local manifestation consecutive to inflammation, due to the previous existence of chancre at the affected site. Fournier believes in a specific fibrous infiltration of the walls of the gut, ulceration of the mucosa sometimes occurring secondarily. Many of the cases of syphilitic stricture of the rectum are due (Esmark, Tuttle) doubtless to the breaking down and the ulceration of gummatous deposits in its walls.

The possibility of recognizing the syphilitic nature of a stricture by histological examination is disputed. Duplay, Kelsey, Quénu, and Hartman believe that there is no characteristic lesion demonstrable. The pathological change consists in an inflammatory hyperplasia succeeded by cicatrization, all of which might arise from any of the causes we have mentioned. Schuchardt believes certain bluish-red nodules found on the surface of the mucosa to be pathognomonic, but it is well known that gummata cannot be at all times distinguished from tubercular formations.

Rieder made valuable observations on tissue obtained from rectal strictures in cases undoubtedly syphilitic. He found chronic inflammatory infiltrations of all the layers of the rectum; the older the case the more connective tissue hyperplasia.

The arteries were almost uniformly normal, whereas the veins were markedly diseased. By means of Weigert's stain elastic fibres were brought out about the veins. Rieder seeks to explain "the frequency of rectal stricture in women on the basis of a spread of the syphilitic virus by means of the veins. The initial seat is usually situated near the fourchette, and from here to the lower rectal veins is a much nearer route than from the foreskin of the male to the rectum by means of the vesical veins."

Rieder gives this involvement of the veins a name—"venosclerosis syphilitica"—but admits that it might be occasioned by other causes than syphilis.

In conclusion, Peterson reports a case of his own in which, without any suspicion of syphilis in the history, changes like those described by Rieder were found in the rectal walls. He believes that examinations in the early stages of the affection in every case would be of great value, and hopes that such investigations will be forthcoming.

ANGIOTRIPSY.

Clement Cleveland¹ says that it is a well-recognized fact that effective hæmostasis depends upon a disturbance of the endothelial

¹ Angiotripsy. *Medical News*, November 11, 1899.

lining of blood channels and the formation therein of blood-clot. Both torsion and compression of arteries have long been used for small vessels, and the latter principle was first applied to large ones thirty years ago by Dr. J. C. Nott, of New York City, when he invented the rectilinear *écraseur*.

His instrument was the forerunner of the powerful compression forceps of to-day. Among these the most powerful is the angiotribe, invented by Tuffier, of Paris, in 1898. Cleveland began using the angiotribe in January, 1899, and, although at first loath to employ a new method which seemed of doubtful efficacy, he soon became convinced of its merits. The instrument may be described as a heavy compression forceps; the jaw surface of each blade is a rectilinear plane which contains a longitudinal groove running through its centre, and shallow, transverse corrugations, to keep the instrument from slipping, on either side of the groove. All of the edges are rounded, so that the instrument compresses, but neither tears nor cuts.

Pressure is supplied by means of a windlass acting upon the extreme end of each of the handles. The instrument is placed after the manner of ordinary hæmostatic forceps, and after the compressing force has been raised to the degree desired it is allowed to remain *in situ* for two minutes. When it is removed a ribbon of tissue the width of the blades is left, with a ridge running along its middle corresponding to the longitudinal groove in either jaw of the instrument.

The line of incision is so placed that a narrow stump projects on the distal side of the compressed area.

The vessel or vessels on either side of the ribbon contain clots; likewise those in the uncompressed ridge at the centre of the ribbon, while between these points the tissues are thoroughly agglutinated.

Before taking up this instrument Cleveland had employed Skene's electric forceps, and was thoroughly satisfied with them. To quote him: "My first success with the angiotribe was so thoroughly startling and so satisfactory that I had at once to completely reverse my decision and admit that this new method was really a step in advance of the electric clamp. I saw that the electric clamp would still have its uses, but that the angiotribe must succeed it in the vast majority of vaginal and intrapelvic cases."

Objections to this instrument are its weight and clumsiness. These criticisms, according to Cleveland, have proved unfounded, for with but a short experience one acquires sufficient dexterity to use it accurately and handily.

It has been opposed on theoretical grounds as inapplicable in vaginal operations where the vagina is small, but Cleveland states emphatically that it would be difficult to find a case "in which the operation of

vaginal hysterectomy was indicated in which the instrument could not be used." The angiotribe was designed originally for vaginal work, but it has served Cleveland equally well in abdominal operations.

He admits that there are certain cases in which the employment of the angiotribe would be, for mechanical reasons alone, wellnigh impossible, and therefore does not claim universal applicability for the instrument.

But that it possesses certain advantages under certain conditions over the older and better established methods of hæmostasis is equally true. Comparing it, for instance, in vaginal hysterectomy with the other methods for controlling hemorrhage, it is clearly superior to clamps left *in situ*, for these drag upon the intrapelvic nerve fibres within their grasp and give rise to severe pain ; moreover, they may slip and allow serious secondary hemorrhage to occur, while the stumps remaining after their removal slough away slowly. Contrasting the instrument with ligation, it is easier to apply and there is less sloughing of the stump, which may be considerable, especially when silk has been used. In some instances the ligatures must be cut away, thus exposing the patient for the second time to the risks of hemorrhage and sepsis.

Compared to the electric forceps of Skene, the only advantages are its ease of application and its cheapness. It does not, moreover, serve so well one of the purposes of the electric clamp, namely, that of sealing up the lymphatic radicles, thus minimizing the dangers of septic absorption. For this reason the clamp is perhaps to be preferred in pus cases, although even here the angiotribe has served very well. Like the electric clamp, the angiotribe does not destroy tissue ; it simply compresses the stumps, which are afterwards revitalized.

Cleveland calls attention to the following points in the practical application of the instrument :

The stumps left after the employment of the angiotribe should be handled as little as possible in order to avoid displacing the clots which are forming in its vessels.

It is best to apply the forceps at right angles to the vessel.

The instrument should not be used too near the pelvic wall at points where the arteries come off from the large trunks, for in those situations the arterial pressure is greatest.

The angiotribe should be applied with the patient in the horizontal position, for if it is used while the patient lies in the Trendelenburg posture a return to the horizontal may so increase the blood-pressure in the compressed vessels as to sorely threaten the integrity of the obstructing clot. If the Trendelenburg posture is essential, then the return to the horizontal position should be gradual. There is no danger of dislodging the clots by the movements incident to removal of the patient from the

operating-table to her bed or even in the straining of prolonged and violent vomiting.

One should take care that the angiotribe be sufficiently strong to afford the pressure of 3000 pounds (although such a degree is not absolutely necessary) without warping or bending out of true. The clamp surfaces must coapt accurately and the edges be so rounded as not to cut the tissue.

A significant fact mentioned by the author is that since using the angiotribe he has had no cases of crural thrombosis—a complication which he is prone to refer to improperly sterilized ligature and suture material.

While Cleveland appears most favorably inclined toward the angiotribe and offers strong arguments in favor of its use, I confess that to discard the ligature for this instrument or any form of forceps does not accord with my conception of safe surgery. The question always arises, when we discuss methods of controlling hemorrhage in vaginal operations, as to whether vaginal hysterectomy is to be preferred to the abdominal methods. As a critic I have maintained in *PROGRESSIVE MEDICINE* that, in general, the abdominal route is to be preferred to the vaginal. While this may be considered a rule, there can be no question but that in certain cases the latter should be the route of election.

The indications which appeal to the advocate of the abdominal route differ widely from those who look upon the vaginal methods as preferable. As one of the former I am most reluctant to perform vaginal hysterectomy in any form of inflammatory disease, and am likewise opposed to its general adoption for cancer of the uterus, and, therefore, I find little or no place for the angiotribe.

A carefully tied ligature always gives me a feeling of security which the clamps never do. In some cases the clamps may urgently be required, for a vessel may slip from the ligature, retract, and cannot again be tied separately. This, however, is unusual, for if the operation is carefully conducted, step by step, the broad ligament only being cut after the ligature is securely placed, this complication will seldom arise. To apply a broad, heavy clamp throughout the length of the broad ligament, with the subsequent necrosis which must follow the crushing of the soft tissues, is not a surgical procedure.

Cleveland claims that these tissues, after the clamps have been removed, become revitalized. This, however, seems questionable, for I have never yet seen tissues clamped sufficiently strong for twenty-four hours to control hemorrhage that ever became revitalized.

Nevertheless, it must be said in favor of the angiotribe, that in the hands of such careful operators as Cleveland it may be of service.

My criticisms are those of one not greatly experienced in the use of

clamps, for I have always preferred the ligature. Experience, therefore, may counterbalance or override a theoretical objection however well grounded.

EXCISION OF THE TUBERCULOUS URETER.

William R. Pryor¹ emphasizes the importance of complete removal of the ureter in cases of nephrectomy for tuberculosis. He says this is unnecessary if the ureter is surely not diseased, but doubts the possibility of determining the question except by actual inspection and palpation. For this reason, and because it affords the opportunity for examining the other abdominal organs and the opposite kidney at the same time, he prefers the transperitoneal route.

The method of Kelly—*i. e.*, removal of the vesical portion of the ureter through a vaginal incision—is classed as a blind and clumsy procedure; and inasmuch as the bladder is a distending organ, any fixation of the lower end of the ureter predisposes to discomfort the patient.

Pryor's method, as successfully carried out in one case, after enucleation of the kidney consists in freeing the ureter by careful dissection down to the uterine artery, and then incising the peritoneum anterior to that vessel and drawing the ureter to the front. The ureter is now amputated about three-quarters of an inch from the bladder and a long surgical probe passed from the ureteral stump into the bladder and out through the urethra.

The eye of the probe is secured with silkworm-gut to the walls of the ureter. The surgeon then pulls upon the probe, drawing it out of the urethra and thus inverts the ureteral stump into the bladder. The probe is retained in position by bending it back over the pubes and the bladder is kept empty by catheterization every two hours.

In Pryor's case the ureter sloughed off about the third week, when the probe was removed. Subsequent cystoscopic examination showed no trace of the inverted ureter except a small elevation at the normal site of the ureteral opening.

As Pryor has only reported one case of this novel method of removing the ureter in tuberculous disease, conclusions cannot be drawn as to its efficiency.

To draw the ureter down through the urethra and leave it to slough off, as in the case just reported, does not appeal to one as a satisfactory surgical procedure. It appears to me that the tissues which must slough off, especially if it is of tuberculous character, would be very likely to

¹ A New Method of Treating the Ureter in Tubercular Disease of the Kidney and Ureter. *American Journal of Obstetrics*, April, 1900.

infect the bladder. The plan, as originally suggested by Kelly, of bringing the stump of the ureter down into the vagina through the incision in the lateral vaginal fornix is a better procedure, for in this way it can be removed close to the bladder wall. The minute amount of ureter from the point of excision to its entrance into the vagina from the bladder wall may be treated subsequently through a cystoscope.

DIABETES ASSOCIATED WITH DISEASES OF THE GENITAL ORGANS.

Upon this subject H. D. Beyea¹ has reached the following conclusions :

1. That symptoms of diabetes and glycosuria are in rare instances apparently dependent upon disease of the genital organs.

2. That glycosuria alone, without symptoms of diabetes, occasionally seems to preserve the same relation of cause and effect.

3. Since these diabetic symptoms are not present, as a rule, in every case of any class or classes of gynecological affections, it is reasonable to suppose that when they are present there is, in addition to the disease of the genitalia which is demonstrable, "some special and separate lesion or abnormal secretion of the genital organs, or some affection of other organs, or some special predisposing condition of the body."

4. That such cases as he describes, and those to which Tait and Decorché give the name "climacteric diabetes," may be cured by the induction of the climacterium, the eradication of the gross lesions which may have opposed the consummation of the menopause or by the progress of the normal climacterium.

In conclusion, he observes that there is sufficient evidence of some relation between disease of the female genital organs and glycosuria or diabetes to stimulate and warrant a careful study of all this class of cases, and experimentation to determine the question of cause and effect.

URETERO-INTESTINAL ANASTOMOSIS.

In a carefully prepared paper Reuben Peterson² has given his inferences drawn from an historical and experimental study of uretero-intestinal anastomosis.

¹ A Case of Multilocular Pseudomucinous Cyst-adenoma of the Right Ovary associated with Pronounced Symptoms of Diabetes. *American Journal of Obstetrics*, February, 1900.

² *Annals of Gynecology and Pediatrics*, May, 1900.

The advisability of adopting such an operative procedure must occasionally present itself to every gynecologist. Needless to say that once adopted there is no retreat, and the patient is exposed to its consequences, good or bad.

Whenever employed it exposes the patient not only to an immediate peritonitis from extravasation of urine and fecal matter, but also more remotely to an infection of the ureters, with all its complications and sequelæ (ureteritis and periureteritis, ureteral obstruction, and hydro-ureter and the various forms of Bright's disease).

In his review of the literature, he found that of sixty dogs operated upon by a number of experimenters where one ureter was implanted into the intestine there was 61 per cent. mortality; and where both ureters had been implanted 87 per cent. In man, Peterson found records of twenty-eight uretero-intestinal implantations. The primary death-rate in these was 32 per cent., but of the nineteen survivors there are subsequent notes to show that four succumbed at a later date from kidney involvement.

Maydl, in 1894, reported several cases of exstrophy of the bladder in which he had employed an original method of uretero-intestinal anastomosis, consisting of an implantation of the vesical trigonum with its ureteral orifices into the sigmoid flexure. The primary and secondary results of this operation are superior to those of any other. Of thirty-six cases there were seven deaths, five immediate and two remote.

Peterson operated upon sixty-five dogs, employing unilateral and bilateral utero-intestinal anastomosis and Maydl's modified form—uretero-trigono-intestinal anastomosis. His conclusions are as follows:

1. Simple uretero-intestinal anastomosis is unjustifiable either for the purpose of making the patient more comfortable or as in exstrophy of the bladder, vesicovaginal, or ureterovaginal fistulæ or for malignant disease of the bladder; for it has been shown that all efforts to prevent ascending renal infection after this operation in man and animals prove futile, and it is impossible to tell beforehand the extent of infection that may result from its employment. The patient may die in a few hours of peritonitis, or in a few days of pyæmia, or in a short time of pyelonephrosis, or, in rare cases, may recover with contracted kidneys.

2. Utero-trigono-intestinal anastomosis is justifiable, for it has been shown that while ascending renal infection may occur after this operation, the infection, as a rule, is of such a type that the individual's chances for recovery are good.

3. It has been abundantly demonstrated by experimental and clinical work that the rectum tolerates the presence of urine and acts as a good substitute for the bladder, and that good control over the anal sphincter is maintained.

DISINFECTION OF THE HANDS.

The question is constantly arising as to the relative values of the mechanical and chemical methods of disinfection of the hands. Some surgeons insist that thorough washing the hands with soap and strong bristle brushes is sufficient to eliminate as completely as possible all infectious germs from the skin. On the other hand, the majority of surgeons claim that the best results are achieved only through the combination of the mechanical and the chemical methods. The two methods of disinfection which have been chiefly employed after cleansing the hands and arms in soap and water have been the alcoholic, which consists in washing the hands in 95 per cent. alcohol, followed by immersion in bichloride of mercury solution; and the permanganate and oxalic acid methods, which consists in immersing the hands in a saturated solution of permanganate of potash, followed by decolorization with a saturated solution of oxalic acid. As to the value of chemical disinfection there can be little or no question, for the most thorough washing will not eliminate all of the bacteria from the skin and from the hidden parts of the nails. We are, therefore, compelled to resort to the chemical to supplement the mechanical method of sterilization.

A recent research on disinfection of the hands has been made by Krönig and Blumberg,¹ in which they show conclusively that chemical antiseptic agents greatly supplement the mechanical cleansing. In these experiments two cleansing methods were employed; the first consisted simply of soap and water with stiff brushes, and the second of soap intimately mixed with minute particles of marble, as recommended by Schleich. Not only were the experiments carried out on the skin of living individuals, but also upon the cadaver. In the experiments upon the cadaver anthrax spores were rubbed deeply into the superficial epidermal layers of the leg and then dried, after which the skin was washed in different ways. After thorough mechanical cleansing of the parts, tiny bits of the skin were snipped out with sterile forceps and scissors and inoculated into mice, which are especially susceptible to anthrax infection. A further series of experiments were conducted under different conditions, the results of which may be briefly summarized as follows:

Seven cubic centimetres of the filtrate from an actively growing culture of anthrax bacillus were energetically rubbed into the skin of the leg of a dead child. This was allowed to dry for an hour and a half, after which five tiny bits were excised and placed in a small dish of sterile water for eight hours. These pieces were inoculated

¹ Beiträge zur Händedesinfektion, Leipzig, 1900.

beneath the skin of five white mice. Result: All five mice died of anthrax, three in thirty-six and two in forty-six hours. Pieces of skin planted upon agar culture media showed active growth of the anthrax bacillus. Next, the skin was energetically washed for fifteen minutes, the water, soap, and vessels used in the cleansing process being changed twice during this time. After this the skin was rinsed for one minute with several litres of distilled water. Five mice were inoculated with pieces of the skin from the newly washed area. Result: Of the five mice three died of anthrax and two lived. Of the pieces of skin which had been planted upon agar media as a control experiment two showed a growth and three were inactive. In the third series of inoculations the skin was washed thirty minutes as above described, with the exception that the water was changed only twice during the thirty minutes. Ten mice were inoculated. Result: One mouse died of anthrax and one of some disease which was not traceable to anthrax infection. The other eight lived. Of the ten agar plates inoculated at the same time only one showed a growth. This series of experiments proved that in a comparatively short time the skin may be so completely freed from anthrax bacilli that only the smallest proportion of the inoculated animals were infected.

In the next series of experiments Schleich's soap, which consists of marble dust intimately mixed with green soap, was employed. The skin was washed vigorously for fifteen minutes in running water, the brushes and utensils being changed three times during the cleansing process. Ten bits of skin were snipped off, five were inoculated into mice and five were planted upon agar plates. The results were as follows: None of the mice died of anthrax, and the cultures on the agar plates were negative. To test the value of frequently changing the brushes the skin of another part was washed for fifteen minutes with one brush and without change of water. Ten mice were inoculated and the results were again negative.

In the third series of experiments fluid soap was used for the cleansing process; of five mice inoculated one died. From this series of experiments these investigators discovered that energetically washing the skin for fifteen minutes will, in the large majority of cases, free the hands from infectious organisms.

In another experiment a considerable portion of skin was removed, a short time after death, from the body of a man who had committed suicide. This piece of skin was stretched on a board and inoculated with anthrax cultures, which were rubbed in for five minutes and allowed to dry for one hour. The skin was then thoroughly washed for five minutes with green soap and sterilized brushes, and pieces were inoculated into mice. Four died of anthrax, five lived, and one died

without an identified cause. In order to determine the efficiency of mechanical cleansing of the hands cultures of the micrococcus tetragenous, which is pathogenic to mice but not to human individuals, were employed. This micro-organism is more resistant than anthrax bacilli, and therefore serves well for experimentation. In one series of experiments three students first mechanically inoculated their hands with this organism and then energetically washed them for two and a half minutes. A given quantity of culture media was divided into three equal portions and energetically rubbed into the skin of the hands and allowed to dry. The hands were actively scrubbed with green soap, sterilized brushes, and hydrant water for two and a half minutes. After this the hands were rinsed in distilled sterilized water. In order to obtain the cultures the hands were then rubbed with marble dust and sterile bouillon, which was collected in a sterile dish. From each student five mice were inoculated. From the first and second all of the mice died, and from the fourth three died.

In the next series of experiments the hands were washed for four minutes as before, and the cultures were taken as usual and inoculated into six mice. The hands were then washed for twelve minutes longer, and the same number of inoculations made. The results were as follows: Of the six mice inoculated after four minutes' washing five died of tetragenous infection; of the six inoculated after twelve minutes only three died. As a result of these experiments Krönig and Blumberg came to the conclusion that from simple mechanical washing of the hands with soft soap, water, and brushes the skin may be partially cleansed of the micrococcus tetragenous, and in all cases there is a decrease in the number of bacteria. But these last experiments show quite conclusively that simple mechanical washing will not entirely free the skin from all bacteria, for even when the cleansing process is continued for twelve minutes 50 per cent. of the inoculated animals died.

In order to further study this question the very resistant hay bacillus, which is found in commercial catgut, was employed. After infecting the hands with this bacillus they were washed energetically in the usual way for ten minutes and then rinsed with distilled sterilized water. Notwithstanding this thorough cleansing a vigorous growth of the bacilli was obtained in every instance.

In the next series of experiments the hands were cleansed with Schleich's marble dust soap. Three mice were inoculated and all died. Even when the hands were energetically washed for fifteen to thirty minutes with Schleich's soap every culture showed numerous colonies of catgut bacilli.

From these experiments Krönig and Blumberg conclude that mechanical cleansing of the hands is not trustworthy, as claimed by Schleich

and Sanger. Next the various chemical methods of disinfection were studied in order to determine which is the most trustworthy. First Reinecke's alcohol method was tested with a view of determining how it assists in the disinfecting process. It is well known, as these writers point out, that even absolute alcohol is not a germicide. Even Reinecke himself does not make any such claim, but states that from the use of alcohol the detachable layers of the skin along with the contained bacteria are cast off. This statement is based upon the bacteriological observation that after resistant catgut spores are rubbed into the skin and then subsequently washed with alcohol and brushes no growth is obtained from the skin, but myriads of bacilli may be cultivated from the debris in the alcohol. Under these circumstances Reinecke came to the conclusion that his method is simply mechanical, the germs along with the loose epithelial cells being cast off through the agency of the alcohol. Kronig, Gottstein, Blumberg, Paul, and Sarwey claim that Reinecke's explanation is based upon an error, for, according to their observations, the reason cultures are not obtained from the skin after the employment of this method is that the action of the alcohol renders the taking of cultures from the surface of the hands and arms much more difficult. In proof of this Kronig refers to his experiment in which five mice had been inoculated with pieces of skin from the leg of a cadaver which had been washed fifteen minutes with soap and water and only one animal died from anthrax, whereas the opposite leg was energetically scrubbed for a like time with absolute alcohol, and of five mice which were inoculated four died. In view of this experiment Kronig and Blumberg feel justified in discarding the Reinecke method. Had this method not been thoroughly investigated before by other good workers we might feel that it was being condemned on entirely too slight evidence, but in view of the accumulated evidence an error has undoubtedly crept into Reinecke's investigations, and his conclusions are therefore fallacious.

In Kronig and Blumberg's further remarks upon the subject they call attention to the fact that chlorine, bromine, and iodine in pure solution exercise a very strong disinfecting action. The objection, however, to these chemicals is the irritating gases which are generated from them. In their further experimentation they have investigated the action of a 2 per cent. solution of permanganate of potassium mixed with a 1 per cent. solution of sulphuric acid. The active disinfecting agent is chlorine, which is liberated during the use of the solution. The hands were energetically washed for fifteen minutes with soap and brush, the water being changed three times; then followed the immersion in the permanganate solution until they were of a dark mahogany-brown, followed by decolorization in oxalic acid for ten minutes. Not-

withstanding this care, a very luxuriant growth of catgut bacilli was obtained. From this they conclude that even the combination of these two solutions, which have previously been considered so effective, is not reliable. Having proved to their satisfaction that none of the commonly employed chemical solutions are active germicides when applied to the skin, they sought for a solution which is of sufficient penetrating power when applied to the skin to not only disinfect the superficial but the deeper layers, and so impregnate the epithelium that even when pieces of it are inoculated into animals its growth may permanently be inhibited. To this end they employed a combined quicksilver and ethyl-endiamin solution. To discover whether this combination was more irritant to the skin than the usual 1 per cent. bichloride of mercury solution, control experiments were made on a considerable number of people. While the 1 per cent. sublimate solution alone frequently produced irritation, the combined solution of the same strength was harmless. After establishing this side of the question a series of experiments similar to those made in the preceding cases was instituted to prove its efficiency as a practical disinfectant. First, actively growing tetragenous bacilli were energetically rubbed into the skin of the forearm of a student for five minutes and then permitted to dry. Following this the hands were washed for six minutes with soap and brush and then immersed in 1 per cent. solution of quicksilver and ethyl-endiamin. Following this the hands were thoroughly rinsed with several litres of sterile distilled water and cultures were made. Ten mice were inoculated; five died, but in only one was the bacillus tetragenous found. A second experiment was carried out on a medical student. Before infecting the forearm with tetragenous bacilli it was scrubbed thoroughly for fifteen minutes, then washed three minutes with soft soap, rinsed in water, and then brushed six minutes in 1 per cent. sublimate solution. Of ten inoculated mice five died within the first ten days, but only one died of tetragenous infection. A similar series of experiments was carried out on another student, but in place of the sublimate solution the preparation of quicksilver and ethyl-endiamin was employed. Ten mice were inoculated, of which three died—two of tetragenous infection. From this series of experiments it is tentatively proved that no one solution has any special advantage over another. A number of other experiments were carried out without reaching a definite conclusion. From this extensive series of experiments the authors reached the conclusion that the combination of the chemical disinfection with the mechanical disinfection is much to be preferred to the simple mechanical disinfection with water, soap, and brushes.

With regard to the experiments with the quicksilver and ethyl-endiamin, they have not reached a satisfactory conclusion; on account

of the excessive cost of the experiments, it was not possible to carry them to a satisfactory termination. In the experiments as already detailed 800 mice were used for experimental purposes.

MENSTRUATION AND PSYCHIC DISTURBANCES.

H. Macnaughton Jones¹ inquires : To what degree does the phenomena called menstruation influence the rationality of a woman's mental acts by originating, in the various groups of pelvic nerves, morbid impulses that lead to reflex neuroses in other organs. In other words, how far responsible is menstruation and ovulation for neurotic impulses or for that hyper-exaltation of the nervous system which proceeds from a lowering of both psychical and physical inhibitory control and allows "distorted mental visions and erratic moral acts, vulgarly called crimes, which the woman is helpless to evade or to subdue."

Another problem concerns the relation, if there be any, between pathological conditions of the sexual organs and the various forms of mental alienation, which vary in their manifestations all the way from slight eccentricity to melancholia, mania, and dementia. And, further, how far the correction of the diseased condition is or is not beneficial to the woman, and what influence the operation *per se* has upon the mental trouble either as to relieving or as to exaggerating it.

Considering the physiology of menstruation and ovulation, the prime function of the genitalia, we find here a series of nutritive processes that are very elaborate. They include a general arterial engorgement of the genitalia and remarkable changes in the ovary incident to maturation and rupture of the Graafian follicle, as well as the preparation of the endometrial lining of the uterus for the reception of the ovum. During these changes there is excitation of the pelvic nerves and also of the pelvic ganglia. While this physiological process is very complex, in health there is little or no systemic disturbance ; but the possibilities for such are manifest.

Experiments prove that the ovary has an important bearing upon the metabolism of the entire economy by reason of the so-called secretion. Toralli and Curatullo have shown that if this substance be suppressed the elimination of phosphorus is decreased and the body-weight from a vicious metabolic activity no doubt is increased.

The effect of the ovaries on metabolism is illustrated by the fact that osteomalacia may be cured by oöphorectomy. We know but little con-

¹ The Correlation of Sexual Function with Insanity and Crime. President's Address before British Gynecological Society. Annals of Gynecology and Pediatrics, March, 1900.

cerning the effects of the unstable phosphorous compounds upon metabolism in general and especially upon the cerebral, cerebro-spinal, and sexual impulses. But we know enough to convince us that the influence of a secretion like that of the ovary must be great upon the whole nervous system, from the parts concerned in major and minor reflex acts to those portions of the cerebellum (cortex of anterior lobes) which represent, undoubtedly, the highest type of organized matter to be found in nature.

Lombroso and other workers have agreed that those forms of mental disease usually referred to as degeneracies or vices of psychic organization are often associated in the individual with physical defects, either excesses or arrests of development. These involve not only the higher centres of the nervous structures, but also all the apparatuses and organs in the economy. So that physical deviations from the normal may be and often are indications of perversion, morally or mentally.

If the above holds true, then why may not anomalies, or physical defects, or pathological alterations of the genitalia in women ("organs from which emanate impulses and excitations stirring the deepest depths of her moral nature) have a direct relationship to those motives and actions which we so flippantly embrace under the head of 'criminal'?" Gynecologists, by recognizing the influence upon the mental and moral acts of women which congenital or acquired deviations from the normal in her sexual apparatus obtain, may best study the relationship existing between the faulty discharge of her sexual functions and the various morbid impulses arising therefrom with the criminal acts and motives that are entailed. We find in a large proportion of those women in whom there are pathological changes in the uterus and adnexa, associated or not with congenital irregularities, various conditions which Jones classes under the visceral and reflected neuroses. They owe their existence to the perverted impulses from the abnormal or diseased pelvic organs. In this connection may be included severe headache or a sense of fulness in the head, facial neuralgia, migraine (ocular and laryngeal, with aural vertigo and tinnitus), poor memory, symptoms of hyperæsthesia or anæsthesia of the extremities, spinal irritation, true hysteria, insomnia, anosmia or perversion of smell, general neurasthenic conditions, as agorophobia, œsophageal spasm, gastralgia, and coccygodynia.

More grave manifestations are observed, as epilepsy, hystero-epilepsy, melancholia, suicidal insanity, and dementia.

It is difficult to establish the relationship of cause and effect between abnormalities of the genitalia and insanity. However, one can hardly doubt such a possibility of relation. Picque found in 88 per cent. of the insane gynecological affections, and one-sixth of these were definitely

cured by operation. Hobbs' proportion of gynecological disease in the inmates of his asylum was 12.5 per cent., and of 110 cases operated upon 36 were cured. The association of gynecological alterations and insanity has been similarly observed by Holmes, of Ontario, and Burgess, of Montreal. The most usual symptoms of those pathological states of the sexual organs which lead to mental disturbance are connected with those of atypical menstruation—amenorrhœa and dysmenorrhœa.

Esquerol and Morel believe that menstrual disorders constitute one-sixth of the physical causes of insanity. Coulston has tabulated the symptoms of catamenial insanity—"stupidity and lethargy in some, lack of interest in duty, an antisocial tendency, causeless aversion to relatives, intolerance of control, incompatibility of temper, impracticable, visionary scheming and want of common-sense, sudden development of unaccountable immorality or perverted sexual and reproductive train of thought."

Kraft-Ebbing asserts that in any medico-legal investigation the mental condition of a woman during her menstrual functions, past and present, should be inquired into, and if any change be noted in her ideation at such times the fact should be taken as extenuating circumstances.

When he stops to consider the number of intellectually sound women who suffer from diseased sexual organs, the author, with Clay Shaw, is forced to believe that insanity truly from gynecological causes is by no means common, yet this does not change his conviction that in insanity of the female the existence of pathological states of the genitalia has to be considered as an initiative or sustaining etiological factor.

Regarding climacteric insanity, it has been shown by Coulston to occur in both men and women. It is frequently a melancholia, with a suicidal impulse in 50 per cent. of the cases. Otroschkevitch has demonstrated that in old age the ovaries undergo characteristic changes; according to him, the "germinal epithelium" on the surface disappears; the mature follicles undergo desiccation and the primordial ones are destroyed. The arteries and the fibrous tissue are affected with hyaline degeneration, and finally there is a fatty degeneration of the cellular elements. From such alterations there must be a corresponding decrease in the ovarian secretion.

TREATMENT. The question of the relief of mental alienation by the operative correction of gynecological disorders or the production of mental alienation by the removal of the ovaries or uterus is a disputed one. Jones has weighed the opinions in this regard of Tuke, Keith, Savage, Spencer Wells, Blandford, Percy Smith, Furneaux Jordan, Elzholtz, Sinclair, Martin, Mary Dixon Jones, Rohé, Hurd, and others. Both Hurd's and Rohé's articles are considered *in extenso* in the

following pages of *PROGRESSIVE MEDICINE*. The evidence from these men is often conflicting, but in the main it is chiefly negative. Jones concludes as follows:

1. That the correlation of insanity and disordered sexual functions arising from disorders of the generative organs is a factor to be taken into serious consideration in the treatment of the mentally afflicted.

2. That when there is suspicion that some physical condition of the uterus or adnexa exist which may produce or aggravate the mental affection a careful examination under an anæsthetic, if necessary, should be made.

3. That in the investigation of criminal acts committed by women, either during the menopause or while the menstrual function is either active or suppressed, due weight should be given to the influence exerted by its irregularity or abeyance on the mind of the woman. In doing this her previous history and temperament should be considered.

4. That the special dangers of the climacteric period and the symptoms indicative of threatening climacteric mania should be recollected. The principal of these are moroseness and depression of spirits, attacks of hysteria, occasional hallucinations, delusions with regard to relatives, unjust dislikes, unfounded apprehensions of some grave crime committed or injury inflicted on them, and suicidal tendencies.

5. That in operations on the female generative organs there is a greater predisposition to mental disturbance than after other operative procedures.

6. That women who have previously been insane are predisposed to a relapse by the development of disease in their sexual organs and especially to such recurrence of insanity after operation on these organs. Under all such conditions and in the face of these warnings the greatest supervision and care are required to anticipate the insane impulse and to prevent suicide or crime in the case of women who manifest symptoms that are due to a correlation between disorders of the sexual organs and mental irritability.

The correlation of the psychical peculiarities of nervous women to their menstrual functions is more or less theoretical. While Jones' article is theoretical, nevertheless, in many ways his thoughts are logical and most suggestive. The marked disturbances which occasionally occur in the psychical areas incident to disturbed menstruation are well known. The question always arises in these cases as to whether there exists a pathological basis outside of the genital organs for this nervous upheaval, and whether the exacerbations are merely incident to menstrual congestion or are produced by it. In some instances a lesion may be discovered in the genital area which may justly be taken as a basis for the nervous disturbance. In many other cases, however,

there is not the slightest evidence in favor of such a hypothesis. Patients who show psychical disturbances are frequently treated for weeks or months without reference to possible reflex causes. After having exhausted all ordinary means of treatment without effect the family or family physician may be inclined to seek some symptom or symptoms incident to menstruation as an explanation for the disturbances in the psychic centres. On examination some minor lesions may be discovered. Operation is performed, the patient continues to go from bad to worse, and finally becomes hopelessly insane. In such a case the operation is a mere incident and has not improved or made worse the patient's condition. These cases, however, should be studied most carefully, for the lay world is inclined always, in case of surgical intervention, to attribute the final overthrow of reason to the operation. In one instance which I recall the patient had become intensely melancholic, with suicidal tendencies. These tendencies were aggravated at the menstrual period, giving rise to the vain hope on the part of the family and the surgeon himself that the correction of a retroposed uterus would restore the patient's mental equilibrium. During the convalescence the patient made one fruitless attempt to end her existence by breaking a champagne bottle and cutting the radial artery with a piece of glass. After she recovered from the operation she appeared to be mentally improved, but soon relapsed, and within three or four months succeeded in committing suicide. It is perfectly evident that practically no beneficial result was obtained from the operation and that the mental disease was not improved, for it was unquestionably of central origin, and the periodic exacerbations were merely incident to the increased menstrual congestion. Notwithstanding these disastrous cases every patient with mental disturbances which are greatly exaggerated at the menstrual period should be carefully examined by a skilled gynecologist to determine, if possible, whether there is a physical lesion as its basis.

MENTAL DISTURBANCES ASSOCIATED WITH GYNECOLOGICAL DISEASES.

Post-operative Insanity. Hurd¹ states that the term post-operative insanity would be best confined to those forms due directly to septic infection.

He does not believe that an operation *per se* produces mental disease, but among the exciting causes of the disorder which are more or less potent in every operative procedure he mentions :

¹ Post-operative Insanities and Undetected Tendencies to Mental Disease. American Journal of Obstetrics, March, 1899.

1. The prolonged use of ether, chloroform, and nitrous oxide, which have been known to produce excitement, delirium, mental confusion, and often prolonged mental alienation even where no operation accompanied the exhibition of these agents.

2. The use of iodoform, atropine, sodium salicylate after or during operation, which has caused a form of mental excitement that only lasted until the drug was withdrawn.

3. The mental symptoms after operation which are clearly ascribable to shock, hemorrhage, and exhaustion.

4. The interference with proper cerebration induced by poisonous products in the blood, due to defective action of the kidneys from either a transitory nephritis or a withholding of the water-supply.

Most of these causes, either alone or coincident with surgical interference, produce forms of insanity which cannot be distinguished from the type Rohé has described as due to sepsis.

Among the remote consequences of an operation Hurd mentions the mental disturbance of a premature climacteric insanity—melancholia, delusions of depression and apprehension, or more rarely a prolonged attack of maniacal excitement. Also the senility and rapidly increasing dementia which may be precipitated by removal of the thyroid gland. He is convinced that the mental disturbance in such cases is the result not of the operation *per se* but from the loss of the organs.

It is beyond cavil, then, that the factors in the production of insanities which develop after an operative procedure are numerous and varied; but, as in the great majority of cases none of these causes influence the mind at all, it remains to be considered what is the essential prerequisite for this type of mental alienation. Hurd believes it to be a "neurotic organization predisposed either from hereditary taint or from some acquired nervous weakness to take on diseased action in consequence of any active disturbing influence." As in part proof of this he mentions the frequency with which mental disease develops after the performance of operations to relieve symptoms which are often nervous in character. For example, mental symptoms follow the operation of dilatation and curettage. This is one of the simplest operations and least exposes the patient to those causes previously mentioned. He explains this apparent fallacy by calling attention to the fact that frequently the operation is performed to relieve symptoms which are clearly nervous in character, and in some cases in which, outside of the nervous phenomena, there has been no sufficient reason to justify the performance of the operation.

This brings the author to the gist of his paper, which is to emphasize the importance of a thorough preliminary investigation of the mental tendencies of patients before the performance of an operation, especially

if it is done for the relief of pain. "Pain is so often an accompaniment of disordered states of the nervous system, and so frequently an index to the hyperæsthesia of an individual rather than an evidence of organic disease, that before operation one should make sure there is an organic basis and not a mere symptom of a lowered state of the nervous system."

He says that pain is often but an indication of the various forms of nervous prostration, and that in cases of so-called relapsing or circular insanity, where the patient has alternately cycles of depression or elation, each of which may be months or years in duration, the patient during the period of depression may complain of vague abdominal pain or exhibit subjective manifestations referable to the uterine system. Hurd is sure that if tendencies to mental disease were carefully sought for prior to operation there would be fewer cases of so-called post-operative insanity. This investigation should take into account the nervous conditions spoken of and any hereditary tendency to insanity derived from insane, intemperate, or neurotic ancestry.

George H. Rohé,¹ in a paper entitled "Post-operative Insanity," emphasizes the following points:

1. That most post-operative mental deviations are due to a toxæmia from some form of sepsis. As one reason for this assertion he cites the great diminution during the antiseptic and aseptic era of the "delirium traumaticum" or the "delirium nervosum" mentioned frequently by the older writers. He grants that hereditary or acquired psychopathic predisposition may be the chief factors in such a mental alienation; also that shock, the effects of an anæsthetic or of drugs taken internally or applied locally, and the climacteric itself, may predispose to this functional disorder.

2. That removal of part or all of the pelvic organs is not *per se* an exciting cause. He finds that the number of cases of mental disorder following operation is about the same proportionally in men as in women, but that a majority of the graver forms follow operations upon the abdominal or pelvic organs in women and a large number after plastic operations involving the cervix and the perineum.

3. That the term post-operative insanity refers to the time of development and in nowise to any particular form of mental disturbance. Thus, in a given case, the patient may be maniacal, depressed, or paretic.

4. That the usual type is that of a confusional insanity. This, as a rule, develops suddenly, but may have as prodromes irritability or anxiety.

During the attack temporary lucidity may occur. The patients have no control of their sphincters, and so pass urine and feces in their clothing. The general symptoms of pyrexia, rapid pulse, coated tongue, and

¹ American Journal of Obstetrics, March, 1899.

anorexia are usually present. In advanced cases the pulse may be very feeble, and oftentimes the repugnance to food is excessive. With reference to the manifestations of the disturbed cerebration, Rohé quotes Worcester :¹ "There are two distinct classes of cases which have in common the symptoms of motor restlessness—loquacity, destructiveness, and violence. In one (mania) there seems to be, at the outset at least, an exaltation of some of the mental faculties. The patients appreciate perfectly their surroundings ; perception seems preternaturally acute ; memory appears to be quickened, so that long-forgotten circumstances are related with the utmost accuracy. The patients show an extraordinary quickness in repartee and often a diabolical ingenuity and cunning in mischief. They are always ready with an ingenious and plausible explanation of their extravagant conduct. The elation which is present is the natural reflex of the feeling of unbounded, unimpeded energy. Hallucinations are seldom if ever present ; delusions may be entirely wanting, and if they exist they are the natural expression of the emotional state. In the other class, on the contrary (confusional insanity), there is from the beginning evident intellectual impairment which may exist in any degree, even to an entire failure to recognize any of the persons and things about the patient. Memory is impaired and practically abolished ; the acts of mischief and violence are done without any apparent purpose, and where any explanation of them can be attained it is utterly irrelevant or evidently founded on some preposterous delusion. Hallucinations are extremely common, and with vague, incoherent delusions dominate the whole conduct of the patient. As a rule, there is no evidence of any feeling of elation.

"The distinction between melancholia and confusional insanity with depression is of the same sort. The disorder in melancholia is primarily emotional. The patients appreciate perfectly their surroundings ; they recognize persons and things ; they can reason correctly on topics indifferent to them if their attention can be fixed upon them ; their delusions are the expressions of the overpowering feeling of impending evil, which makes everything inconsistent with it seem incredible. In confusional insanity, on the contrary, when there is a feeling of depression, it is the result of the delusions, which are vague, incoherent, and illogical."

5. That the prognosis is generally favorable. The greatest danger is from death due to exhaustion. Under careful and early treatment 75 per cent. should recover. Permanent dementia is infrequent. The treatment advised by Rohé is confinement to bed ; residence in an asylum or institution ; the ingestion of large quantities of easily digested

¹ Transactions of the American Medico-Psychological Association, 1894.

food ; stimulants, if there is much pyrexia, and the employment of warm baths, opium, or other hypnotics for delirium and insomnia.

Two cases have been reported in which improvement followed the use of dried animal extracts, but Rohé does not draw any conclusions from these instances.

The Relation of Insanity to Pelvic Diseases. A. T. Hobbs¹ has concluded that diseases of the generative organs in the female are potent factors in the causation of mental alienation.

Hobbs during the past five years has had 800 insane women under his charge. Of these 220 gave evidence of some gynecological disease and were examined. Among them 188 women had distinct lesions of the genital tract. This would be about 23 per cent. of the entire number (800). The diagnoses made were as follows :

Subinvolution of the uterus and endometritis	132
Dysmenorrhœa and menorrhagia	18
Diseased or lacerated cervixes	62
Cervical polyps	5
Retroverted or prolapsed uterus	66
New-growths: benign, 16 ; malignant, 2	18
Tubal and ovarian disease	33
Vaginal and perineal lesions	37

Operations were performed upon 173 patients.

Curettage was performed	131 times.
Trachelorrhaphy and amputation of the cervix	53 "
Alexander's operation	37 "
Ventrosuspension of the uterus	13 "
Perineorrhaphy	27 "
Ovariectomy	22 "
Hysterectomy (abdominal)	14 "
" (vaginal)	9 "
Myomectomy	3 "
Celiotomy for tubercular peritonitis	2 "

Resulting from these operative procedures, he says : " We witness in some cases that an immediate restoration of the mental functions followed the operation. We observe in others a steady progress toward a normal mental condition."

Summary of 173 gynecological cases :

73 = 42 per cent., recovered mentally.
41 = 24 per cent., improved.
55 = 32 per cent., remained unchanged.
4 = 2 per cent., died.

Reviewing this series he says : " It is evident from the recital of these cases that diseases of the organs whose physiological function is the

¹ "The Relation of Insanity to Pelvic Diseases and Other Lesions." American Journal of Obstetrics, January, 1900.

reproduction of the species are strong factors in determining the status of the mentality of women. It would also seem from this that it is of the highest import to the preservation of the mental equilibrium that the condition of the pelvic organs should be early inquired into if a woman presents premonitory symptoms indicating the onset of insanity."

Hobbs does not claim that operative treatment in insane women with gynecic disease is a panacea, and admits that in a certain number of the cases cited the patients would probably have recovered their reason without any operation, as many of the cases were of a minor type; but he is positive that even in these the recovery was hastened by the treatment.

He says that 52 of the 114 patients who either recovered or improved had been insane for two years or more. This series of cases extended over a period of four years; the percentage of recoveries during that time of the total number of patients was 51 per cent.; this is contrasted with the proportion of the four years previous, which is 33 per cent.

Hobbs does not believe the beneficial effect is derived from the operation *per se*, for twenty-three Bassini operations upon insane patients were not followed by any improvement in the mental condition.

He also concludes that improvement cannot be attributed to the anaesthesia, for in 600 cases of general anaesthesia there was no modification of the cerebral aberration.

He gives the following table, which shows, according to his own observation, the relation between the various gynecological affections and insanity:

Utero-ovarian disease, inflammatory:	
96 cases	50 per cent. recovered.
Utero-ovarian displacements:	
47 cases	36 per cent. recovered.
Utero-ovarian tumors and affections of the vagina and perineum:	
30 cases	26 per cent. recovered.

PREVENTION AND TREATMENT OF VENTRAL HERNIA FOLLOWING CELIOTOMY.

The closure of the abdomen has been one of the most widely contested questions of the last decade in abdominal surgery. Almost every operator follows a method which he considers more or less peculiar to himself. Until recently tension sutures which passed down through the skin, fascia muscle, and peritoneum were generally employed in Europe and to a considerable extent in this country. Another commonly employed consisted in the separate closure of the peritoneum, then the interrupted tension suture down to the peritoneum, and finally intervening approxi-

mation skin sutures. Of late the layer method has unquestionably become the popular one, the peritoneum, then the muscle and fascia, and finally the skin being in turn separately sutured. Two principles are involved in the closure of abdominal wounds : One, the careful bringing together of muscle surfaces ; the other, which I look upon as decidedly the better, the painstaking approximation of the aponeurosis of the muscle. The longitudinal fibres of muscle bundles very lightly cling together and even slight traction with tissue forceps or with suture will separate them, hence the apparent inefficiency of a pure muscle suture. While an assistant in the gynecological service of the Johns Hopkins Hospital the closure of all abdominal wounds was left to my care, and I endeavored by practical application to determine definitely the best of the generally employed methods. First the through-and-through method, the peritoneum being first closed by a continuous catgut suture, was employed in several hundred cases, the greatest possible care being observed to bring into close apposition the edges of the aponeurosis of the recti muscles. The chief objection to this method was the greater liability to infection along the suture tracts ; therefore Halsted's method, which consisted in the interrupted buried silver-wire suture through the muscle and its aponeurosis, with a subcutaneous silver suture for the perfect superficial closure, was tried. A variation from Halsted's method was soon made, for we accepted the principle that the strength of the wound depended upon the coaptation of the aponeurotic rather than the muscle edges. For a time this method was thought to be ideal, for although a small proportion of wounds suppurred the majority of these ultimately closed without necessitating the removal of the silver wire. This, therefore, seemed to be a very distinct improvement over the use of silkworm-gut as a buried suture. After a large series of cases had been treated in this way it was found, however, that although at the time the patients left the hospital the wound was in perfect condition, ultimately the suture would occasionally work to the surface, just as any foreign body may. This gave the patient no little concern, and in one ludicrous instance brought forth a very sharp criticism from the home physician, who discovered the suture beneath the skin and thought it had been left by mistake. While this method was, in general, most satisfactory—for it was only in isolated cases that this sequel was noted—nevertheless, it appeared to be just that far removed from the ideal. Since this change of opinion I have used in short incisions catgut throughout ; first a continuous suture to the peritoneum, next interrupted suture of larger size through the aponeurosis of the recti muscles, and, lastly, an intracutaneous suture of smaller size. For short incisions this method is ideal. If the incision is long (over four inches), or there is undue danger of suppuration, I use interrupted

silkworm-gut down to and including the aponeurosis of the recti muscle.

An article by Gottschalk¹ discusses the question of the prevention and treatment of ventral hernia following cœliotomy. He has reached the conclusion that it makes no difference whether the incision is made exactly in the linea alba or to the side through the aponeurosis of the recti muscle, but warns against an oblique incision which crosses the linea alba, because the point of crossing is unduly weak and predisposes to the formation of hernia. For the last six years Gottschalk has closed the abdominal wound with two layers of suture, a buried suture of silk including the peritoneum, deep fascia, aponeurosis of the rectus and superficial fascia. Especial stress is laid upon the accurate tying of the sutures so as to bring the edges of the aponeurosis in close apposition. In case the muscle protrudes between the borders of the fascia an extra suture should be used to bring the fascia perfectly together. The suture should be cut as close to the ends as possible. The skin and subcutaneous fat are closed by silk sutures. To prevent the formation of superficial dead spaces in the wound the underlying aponeurosis is caught with its superficial fascia. In emergency cases in which it is necessary to close the wound rapidly Gottschalk occasionally uses the old through-and-through suture above referred to. In addition to the method of suture the following points are to be strictly observed: Absolute cleanliness; thorough sponging of the wound before the sutures are tied; avoidance of all insult to the tissues by the use of forceps, rough handling, etc., and the precaution of all possible contamination of the subcutaneous fat from without or from within. To avoid contamination of the wound Gottschalk clamps the skin and peritoneum together, and thus excludes the fat and muscular tissue from rough handling and contamination. In case the operation has been a septic one, before closing the wound the operator and all his assistants should carefully disinfect the hands and use freshly sterilized instruments.

Since Gottschalk has observed these precautions he says neither sup-puration of the abdominal wound nor post-operative hernia have occurred in his service. In two or three cases in which the patient was in the stage of acute infection at the time of operation a few of the buried sutures have been discharged later. On leaving the hospital Gottschalk requires his patients to wear an abdominal binder for one-half to one year. He thinks this may be overcaution; nevertheless, he does not believe it harmful.

The readers of PROGRESSIVE MEDICINE may remember Abel's splendid article, in which he claimed that the use of the abdominal binder

¹ Archiv. f. Gynäk., vol. lxi., Part 2, p. 403.

gave no protection whatever, and that hernia was quite as likely to occur with as without it. A few writers have even gone further and have claimed that the use of the binder predisposed to the formation of hernia. The use of the binder, it seems to me, is open to the judgment of the operator. If the patient is more comfortable with it, then by all means advise her to continue to wear it; if, on the other hand, it is uncomfortable and gives no sense of support, it should be discarded, for experience has unquestionably taught that the binder is really no protection against post-operative hernia. Where there are small ventral post-operative hernia Gottschalk advises against the employment of a retaining pad over the hernial opening, because it may cause intestinal and omental adhesions in the hernial sac. The symptoms in post-operative hernia, as in any other hernia, depends not upon the size but upon whether the intestines and omentum are adherent within the sac. In the absence of the latter large hernia may exist without symptoms. If there are no threatening symptoms, according to Gottschalk a small linear binder may be sufficient not only to restrain the hernia, but also to prevent an increase in size, and operation, therefore, may not be necessary. If, on the other hand, the intestines and omentum are adherent within the hernial sac, especially in working-women, operation should be advised. Certainly there is no hope for the spontaneous closing of the hernia in such cases, for this can be brought about only through an operation. Simon and Hager, who first attempted the cure of these cases, pushed the hernial sac back into the abdominal cavity, freshened the edges of the abdominal wound, and resutured them. In two cases Simon operated four times before cure was effected. A third step in advance was that of Maydl, who opened the hernial sac, released the intestines and omentum, excised the redundant part of the peritoneum and the skin, exposed and freshened the edges of the aponeurosis, and applied through-and-through interrupted sutures.

Bumm¹ recommends the adoption of the following principle for the closure of post-operative herniæ :

1. Bending the patient forward in a half-sitting posture during the suturing of the wound.
2. Fixation of the fascia.
3. If there is undue tension, lateral incisions to the outer side of the recti muscles. (Hernia is not to be feared from this incision.)
4. Through the combination of longitudinal and transverse sutures, with the patient in the position above described, the hernia may securely be closed.

In two successful cases of Bumm the fist could easily be inserted into

¹ Centralblatt f. Gynäk., 1899, No. 40.

the hernial opening. As a result of Gottschalk's experience he recommends the excision of an oval piece of skin over the hernia; exposure of the retracted borders of the fascia; opening of the peritoneal cavity at the upper angle of the hernia; and careful separation, under the eye, of the intestines and omentum. The part of the omentum which may be adherent with the hernial sac should be excised, because it is usually more or less cicatrized and the seat of inflammatory changes, and if returned to the abdomen may lead to further adhesions. The most important step is the careful suturing of the separate layers and, especially, the perfect approximation of the borders of the fascia. Concerning the amount of skin which may be removed, the old rule of the tailor to cut your coat according to your cloth is applicable.

In order to relieve the suture of as much tension as possible adhesive plaster should carefully be applied tightly over the wound. While this method of Gottschalk is not novel, it is worthy of careful consideration, because the true principles underlying the cure of these cases unquestionably are dwelt upon in his article. I approve heartily the principle of separate suture of the different layers, and especially insist upon the necessity of the perfect approximation of the edges of the fascia. Upon the latter point depends the success of the operation.

DIAGNOSTIC VALUE OF PAIN IN GYNECOLOGY.

Richard Lomer¹ recites his views upon the inferences that should be drawn from pain as a symptom in gynecology.

This work has been participated in by Dr. A. Sänger, who, in pre-facing Lomer's article, declares that although operations on the female genitalia are no longer performed for the healing of all neuroses, local treatment and the use of the knife are nevertheless employed for the relief of pain which is but the expression of hysteria.

From his observations he believes that very often pain is entirely independent of any palpable disorder, and in reality but the evidence of hyperæsthesia either of the abdominal wall or of the genitalia.

In bimanual examination Lomer has found that oftentimes the tenderness complained of by the patient is in the skin of the abdominal wall. Unless one's attention is called to such a possibility, the import of pain and tenderness revealed by a gynecological examination is apt to be misconstrued.

That a misinterpretation may be disastrous is shown many times in the cases which Lomer reports, for they include some in which there was no gynecological disease; others in which pain coexistent with real

¹ American Journal of Obstetrics, April and May, 1899.

or supposedly real lesions was not benefited by operation; and still others where repeated mutilations with the knife only aggravated the condition.

The majority of these cases were afterward relieved or cured by means which justify the author's belief that hyperæsthesias of hysterical origin play no small part in the pains encountered by gynecologists.

Pain is always "of an immeasurable and inestimable magnitude." The word of the patient alone can be taken, but the measure of her suffering must not always be judged from the expression of her face or the manifestations of her pain. The personal equation is such that the exaltation or depression of the ego in every instance modifies accordingly the complaint. It is manifest, therefore, that in all hysterical perversions the ego is exalted.

Hysteria. The diagnosis of hysteria does not as formerly rest merely upon the opinion of the physician or the exhibition by the patient of globus and clavus. Until Charcot's stigmata became known every diagnosis of hysteria was more or less presumptive; but now the diagnosis is based upon the examination for areas of hyperæsthesia and anæsthesia, narrowing of the visual fields, hysterogenetic zones, anosmia, amyosthenia, etc.

If we accept these stigmata as evidences of hysteria, then many persons will be brought under this classification who to the older practitioners never appeared as such—persons who never or but rarely present any symptoms of the condition.

Those cases in which stigmata are present, but symptoms are latent or only excited through the influence of external factors—*agents provocateurs*—are called by Charcot normal hysterics.

The researches of Charcot have shown that hysteria of this type is more frequent than is generally supposed. All vocations, all peoples, and all ages may be affected. The name hysteria is broadly chosen, and it bears no relation to the uterus. In fact, some observers have found it more prevalent among men, especially in the poorer classes.

The fundamental cause of hysteria is heredity. Several degrees of hysteria may be distinguished:

1. Normal hysteria—very wide-spread—latent, and may remain so throughout life. Many of Lomér's cases belong here. Without examining for stigmata, they would not be classified as such.

2. Hysteria as seen by the older physicians; normal hysteria plus agents provocateurs (trauma, fright, infections, hemorrhage, chlorosis, diseases of the sexual organs, intoxication). In these, in addition to the hyperæsthetic and anæsthetic areas being more pronounced, we have the appearance of hysterogenetic zones (cephalalgia, epigastralgia, pleuralgia, sacrodynia).

3. The grand hysteria. In this form convulsions start from the hysterogenetic zones and are interrupted by pressure on the respective spot.

Among the more obscure manifestations of hysteria, especially in women not ordinarily considered the subjects of this affection, are the hyperæsthetic areas upon the abdominal walls. As stigmata Lomer places most reliance upon alterations in sensation of the abdominal skin and anæsthesia of the visible conjunctiva and of the uvula. But he dwells upon the fact that these hysterical hyperæsthesias may affect any part of the genital tract.

Pain. Considering broadly pain as it is met with in gynecological practice, Lomer divides it into five categories :

1. *Traumatic.* In this the nerve endings are directly irritated or are irritated by effused blood. This at first is usually intense, but it soon abates in severity.

2. *Contractile*, as the pains of labor or where there is distention of the bladder or Fallopian tube, rhythmical in character and "typical in its recurrences."

3. *Inflammatory.* This is caused in part by the morphological changes in the parts causing an irritation of the nerve endings, either from pressure or from the direct chemical or toxic effects of the pus corpuscles. It is described as sticking or cutting, and when the pain is increased with each pulse-wave as gnawing or beating.

4. *Neuralgiaform Pain.* Under this head may be grouped neuritic and neuralgic pain. Neuralgia is paroxysmal and more severe than neuritic pain. The latter is more permanent, less intense, and is frequently accompanied by trophic disturbances, herpes zoster, and herpes vulvæ. Both sorts of pain follow the course of certain nerves.

5. *Hysterical Pain.* This is not necessarily connected with any organ or division of nerves. It chooses its site independently of the course of the nerves. It may be manifested as hyperæsthesia of the skin or mucous surfaces or of organs (visceral hyperæsthesia). It is usually of central or psychical origin and is influenced by suggestion. It is frequently spoken of as having a burning character.

The uterus is not very susceptible to pain from traumatism. Perforation of the uterus by an instrument or rupture during labor have repeatedly occurred without pain.

Contractile pain in the uterus may be due to the presence of abnormal contents. In dysmenorrhœa with endometritis the swollen mucosa acts as a foreign body ; so in incomplete abortion, polyps, retention of blood-clots or lochia contractions and pain occur.

Inflammatory pain in the uterus arises principally from the involvement of the peritoneal covering ; for although in chronic metritis there is a numb sensation in the part, it otherwise closely resembles contractile

pain. In parametritis—especially the so-called parametritis posterior—where there is involvement of the uterosacral folds there is acute pain.

The best examples of neuralgiaform pains are those of advanced carcinoma which occur paroxysmally, usually in the evening or at night. They are violent in degree and affect the back and limbs. Hysterical hyperæsthesias of the uterus are illustrated by many of Lomer's cases in which, although dysmenorrhœa was pronounced, it was relieved by suggestion and galvanism after curettage and dilatation of the cervix had failed. When we consider pain with relation to the ovary we find that the traumatic quality is hard to specify. For instance, the parenchyma of the normal ovary is insensible to the puncture of a needle; the bursting of a Graafian follicle is never felt under normal conditions, and upon pressure on the organ during gynecological examination, if there is any effect produced at all, it is rather a specific sensation bordering on faintness than any actual pain.

Inflammatory pain in the ovary is hard to distinguish because the neighboring tissues, and especially the peritoneum, are always coincidentally involved. The pain observed from ovaries adherent in Douglas' pouch depends no doubt upon the accompanying peri-oöphoritis and the complications in Douglas' folds. Concerning neuralgias and neurroses of the ovary, Lomer regards most of them as cases of hysteria.

Lomer mentions but two sorts of pain emanating from the tubes: one traumatic, as from the rupture of a tubal pregnancy, and the other contractile, as occurring during tubal abortion. The contractile pain is typical and characteristic in pyosalpinx. He expresses incredulity over palpation of a tube not the seat of structural changes, and therefore does not discuss neuralgiaform pain or hysterical hyperæsthesias.

Under the heading "Urethra and Bladder," Lomer gives as an example of traumatic pain that incident to catheterization; the urethra is very sensitive, and the small injuries produced in the mucous membrane by catheterization may subsequently cause pain on urination.

The bladder itself is shown to be comparatively free of this sort of pain by the fact that pessaries may press upon or ulcerate through the *bas fond* without much noticeable discomfort.

The chief pain on catheterization is caused by the contraction of the vesical sphincter. The same is true of all the contractile pain originating in the bladder—*i. e.*, the pain of tenesmus, of cystitis, and of urethritis, and even the peculiar bearing down sensation of an over-filled bladder—all are to be referred to the action of the sphincter.

The severity of an inflammatory pain of the bladder is well known, but this even seems in part to be contractile, for a woman who has cystitis accompanying a vesicovaginal fistula suffers very little except from the irritation of the external genitalia by the overflowing decomposed urine.

Neuralgiaform bladder pains under the titles of "irritable" bladder or "neurosis" of the bladder have been described. Lomer believes that a number of these cases would be found to be hysterical were they examined for stigmata.

He further states it as his conviction that most hyperæsthesias of the bladder are hysterical, and that the term hysterical hyperæsthesia is a better term than neurosis or irritable bladder for painful affections of that viscus where no organic change in the walls or contents is discoverable.

Coming now to the consideration of the painful sensations originating in the peritoneum, traumatic pain is slight or absent unless inflammatory changes are present.

Under Schleich's method, when there is complete anæsthesia of the skin, the gut may be handled without pain. Rough tearing or contusion of the peritoneum does not cause painful sensations, as demonstrated in ligation of a pedicle or in the separation of old adhesions.

Inflammatory pain is very marked, and in explanation Schleich says: "In the normal intact peritoneum the sensitive nerves are isolated. As soon as there is any change from the normal in the tissues the isolation ceases." He compares this with excessively painful granulations. He has looked for nerve fibres in them after most careful staining, but without finding any. "He believes therefore that there is here a surface contact between the infiltrated and deeper lying nerve endings through the agency of the pathologically changed connective tissue."

Hyperæsthesia of the peritoneum which may occur in hysteria cannot easily be separated from that of the viscera which it encloses or from that of the abdominal walls.

Lomer has endeavored to classify the pains occurring in the lumbar and sacral regions, but speaks of his efforts as but an attempt. In this lumbar and sacral region is located the connecting link between the pelvic viscera and the brain. The sensation, however, is not referred to the area from which it really springs, but to some part of the lumbar or sacral region.

Taking up the various types of pain, we find that traumatic pain arises from injuries which, with the exception of fracture or dislocation of the coccyx during childbirth, belong more to general surgery than to gynecology.

Acute and chronic rheumatic pains are the best examples of the inflammatory variety. The acute form—lumbago—is too well known to need description.

Under the classification of neuralgiaform pains a large number of painful sensations in the back are considered. First of all, in neurasthenia there is a sensation of tiredness and want of support to the small

of the back. Lomer explains this by saying that the muscles of the small of the back have to do the severest work of any; that is, they support the trunk, so that every tired feeling of the body shows itself in this region. The complaint is usually bilateral and is marked by a desire of the patient for something to support the part. Next we have "genuine neuralgias of the intercostal nerves, with their painful pressure points, their typical limitations, and unilateral location."

To these neuralgiaform pains must be added those originating from the pelvic organs but referred to the back. They are especially severe whenever their cause is located near the recto-uterine folds, which Lomer calls the "bane of gynecology," for they are somewhat painful on palpation even in a normal woman. Any involvement of this region, as a pulling upon it during labor or in prolapsus uteri, or pressure upon it from a retroflexed uterus, or by a hæmatocele, or an exudate, or a new-growth, produces painful sensations in the back.

Coccygodynia is a pain difficult to classify. According to Olshausen, in severe cases it is the result of traumatism. Graefe, on the other hand, attributes but small significance to trauma as an etiological factor, and Lomer tends to coincide with him in that view, for he says "the pain occurs a long time after the suspected trauma is cured and recurs after a space of time."

That the pressure of a retroflexed uterus may furnish the cause for coccygodynia is doubtful, but hemorrhoids and fissure in ano may simulate it.

Hysterical pain in the lumbar and sacral areas is mentioned by Charcot, who describes two hysterical zones along the spinal column. Many pains in the back could be placed in this category, but it is extremely difficult to distinguish them from the genuine pain which is so common in this locality.

Returning to the subject of pain in the abdominal walls, we see it in the traumatic form after laparotomy. When wounds heal by primary union this pain subsides in from twenty-four to forty-eight hours.

Inflammatory pain is encountered in infected abdominal wounds and in abscesses of the abdominal walls. Lomer says that the abdominal muscles are infrequently the seat of rheumatic affections.

Neuralgiaform pain occurs in neuralgia of the intercostal and lumbar nerves; also in neuritis with herpes.

Hysterical hyperæsthesias have been spoken of before. They are mostly found to the right of the linea alba and a little above the ovarian region.

Charcot has found the hyperæsthetic zones usually about the size of a silver dollar. Lomer has met them the size of his hand. The author mentions, as does Winscheid, the changeableness of hysterical anæsthe-

sia. "Parts of the skin which are markedly hyperæsthetic one day may be anæsthetic the next day." This shows the psychogenetic nature of the pain.

Among the general characteristics of hysterics are to be noted their tendency to exaggerate every symptom and to furnish extraordinary and phenomenal manifestations of their ailment. They have ever in mind the thought of their condition, and become constant attendants at the office of their physician. In some instances marked psychical disturbances are observed. They become morbid in their desire for surgical relief and seek it with a recklessness that shows an indifference to danger; or they may be disinterested as to their chances of recovery, and in this show perversity of character, "since, without regret, they cause their relations sorrow, great loss of money, or anxiety." This is a moral degeneration "which always turns about the ailing sensations of the morbid ego and is subject to the influences of the changeable, self-hypnotized self."

There are, nevertheless, patients with undoubted hysterical stigmata who are noble and unselfish in character. These are the uncomplicated cases of hysteria, while the former is hysteria plus a mild psychosis.

In the relief of these victims of hysterical disturbances we must first of all determine as closely as may be how much of pain is due to organic changes and how much to those hyperæsthesias which have been discussed at such length. While Lomer does not discredit operative procedure upon the female genitalia, he has, however, observed a number of cases in which repeated attempts to eradicate pain with the knife have failed, and which subsequently have yielded to psychical treatment.

It is, therefore, a warning which he would sound, that all painful sensations brought to the notice of a gynecologist are not due to demonstrable structural alterations, and that many of them are of hysterical origin. He would in every case attempt to correct with the knife or by local treatment any abnormal condition; but if the symptoms remained partially or wholly unremedied he would carefully search for hysterical stigmata before considering further operative correction.

TREATMENT OF HYSTERICAL CONDITIONS. In the treating of hysterical anæsthesias, suggestion or psychical influence is of paramount value.

Under suggestion must be included the personality of the physician and his method of handling the patient. He should at first go minutely into every detail of the patient's suffering, even though this consumes considerable time. This will tend to assure the patient that the physician realizes her true condition and takes an active interest in her welfare. Furthermore, he must appear to be absolutely certain that she

will recover and avoid any expression which might be construed as a doubt.

The patient should gradually be made to dwell less upon the gravity of her disorder by diverting her thoughts and energies in another direction.

Thus she should be asked to visit the physician's office instead of having him go to her. The question, "How are you?" should be avoided, for it implies doubt.

The advice "to fight their trouble" usually results in no good or in discouragement, for they have probably tried this many times before and believe it useless. It is better to show them that their moral opposition is unnecessary, and assure them that their trouble will come right of itself.

The family should be instructed to not appear concerned about her illness, and by their conversation should engage her mind in other directions.

If the home influence of the patient is unsuitable, as when the family is uncongenial or too solicitous, it is well to remove the patient to an institution where the rest-cure may be employed.

When the patients are deeply convinced that they are the victims of gynecological disease, and the result of an ordinary examination does not shake their conviction, they will sometimes yield to the physician's word after an examination under ether. If after such an examination one can positively tell the patient that her organs are perfectly normal a magic change in her general morale may be noted. The patients do not consider their sensations, but bow before the authority of the careful examination in narcosis.

Any change in the life and habits of the patient which will awaken a new interest is valuable. For this purpose definite rules of exercise, learning photography, taking up the study of a language, or the use of a typewriter, or the translation of a book may be mentioned.

The use of the electrical current in these cases has met with success in Lomer's hands. He admits that the influence of suggestion cannot be eliminated in accounting for its results, still he believes that suggestion plays a minor part.

Among drugs for this condition, iron stands pre-eminent. Bland's pill should be given continuously for four months, and then after an interval again. "We cannot lay too much stress upon the fact that chlorosis and anæmia are a fertile field in which hysteria occurs, and that we always strike the right path when energetic iron medication is used."

Quinine and nux vomica may often be combined advantageously with iron, or syrup of the hypophosphites may be employed. Alcohol is forbidden.

Narcotics are of very little use in hysterical pain, and this fact is even of diagnostic value. In the convulsive form of hysteria Lomer recommends valerian and asafœtida.

In conclusion Lomer says: "If I have succeeded by this presentation of my ideas in calling the attention of gynecologists to the fact that before they take the knife in hand to interfere in a given painful affection they should think of the very common occurrence of hysterical hyperæsthesia, then the object of my work has been fulfilled. The reproach to the gynecologist by the practical physician and the neurologist, the furore for indiscriminate operations after the recognition of the psychical nature of these pains, would be checked. It is evident from our presentations that when for a painful local trouble a rational treatment is used and is of absolutely no use we are very likely not dealing with a local trouble, but we have a hysterical hyperæsthesia. Even should we find a local morbid condition, that may be complicated by coexisting hysteria."

STERILIZATION OF CATGUT.

G. Brown Miller¹ gives the results of tests which he has made to determine definitely the relative value of several of the most popular methods for the sterilization of catgut.

The advantages of an absorbable ligature and suture material is well known, and of these catgut is the best, to which, however, there has been a serious objection, viz., the difficulty in its sterilization. This lies not so much in the mere rendering the gut sterile, but in doing so without seriously impairing its tensile strength and pliability. But the first essential requirement of any method of preparation is absolute sterilization.

Miller believes that the efficiency of a method cannot be based upon good clinical results, for methods have been reported which, although satisfactory clinically, have proved faulty on bacteriological tests.

As an explanation of this discrepancy the author states that by certain methods the least resistant bacteria are destroyed, while the growth and development of the more resistant are somewhat inhibited. If catgut prepared by such a method is placed in tissue well supplied with blood the remaining bacteria and their spores, already weakened, will be destroyed by the leucocytes and the tissue juices. Placed, however, in wounds where opposite conditions obtain, as for instance in a large blood-clot or where the blood-supply is poor, and a serious result may follow. The organisms, under these favorable conditions, will grow

¹ Johns Hopkins Hospital Bulletin, September, 1900.

and develop as upon the ordinary nutrient media of the laboratory, and may after a time acquire sufficient power to cause most disastrous consequences.

Even bacteria ordinarily not classed as pathogenic may cause suppuration of a blood-clot, with its train of evils. As confirmatory of this statement Miller has frequently observed in his experiments the inhibitory action of various methods. In some cases the prepared material when placed immediately upon nutrient agar or gelatin would show no growth, whereas placed in bouillon first for several days they would develop and then, transferred to agar or gelatin, would grow luxuriantly.

Beside rendering catgut sterile, without impairing its pliability and strength, an ideal method should not require too much time or trouble; the gut should not be altered greatly in size; it should be non-irritant, and should be preserved in some form in which it is protected from contamination and may easily be handled. The various methods in use at present depend upon heat or some chemical germicide or a combination of the two. If the destruction of bacteria alone were required, dry heat would be supremely satisfactory; but that alone, unless unusually carefully used, impairs the strength and pliability of the catgut. Chemical agents are uncertain bactericidally, and investigators are becoming more and more convinced of this fact. Many of these methods, although faulty, are reported upon favorably after bacteriological tests, but Miller believes that Reppert has solved this riddle.

When contaminated ligatures are soaked in germicidal solutions and afterward directly transferred to culture media, enough of the chemical agent may remain in the fibres of the material to prevent the growth of any organism still alive; but if this same material is carefully freed of the chemical by washing before inoculation the bacteria will develop luxuriantly. Miller has investigated the following methods: Schäffer's, Vollmer's (formalin), Reverdin's (dry heat), Krönig's (cumol), and Sweetnam's.

He used coarse silk threads in these tests instead of catgut, as they were more convenient. These threads were rubbed into cultures, three or four days old, of the bacillus anthracis, bacillus subtilis, bacillus megatherium, and a resistant potato bacillus; the cultures used invariably contained numerous spores. After sterilization the chemical ingredient, if there had been any employed, was removed from the threads, and then cultures were made.

In most of his trials Miller was satisfied on recovering any of these bacteria, and no attempt was made to keep the various species isolated. However, in some instances, as in the experiments with Schäffer's method, he used pure cultures of the bacillus anthracis, which were recovered in every instance.

Schäffer's. This method consists in placing the catgut in a solution of—

Pure mercuric chloride	1.5 gm.
Alcohol	212.5 c.cm.
Distilled water	37.5 "

and slowly bringing it to the boiling-point in a special apparatus devised by Schäffer. After boiling for fifteen minutes the solution is allowed to cool five to ten minutes, when the catgut is removed to 95 per cent. alcohol for preservation. After preparing strands of silk in this way the mercuric chloride remaining in them was neutralized with the gas obtained by heating ammonium sulphide. The mercury was precipitated as a sulphide, which is not germicidal.

In every instance, after Schäffer's method, positive cultures were obtained (eleven times). In four pure cultures of anthrax were used and each time recovered. This method is therefore unreliable.

Kossman's. Directions for this method call for immersion of the gut for twenty-four hours in a 2 per cent. formaldehyde solution. It is then washed and shaken several times in Tavel's solution, which consists of—

Sodium chloridis	7.5 parts.
Sodium carbonatis	2.5 "
Aqua destillate	1000 "

This is to remove the formalin. In Miller's application of this method he neutralized the remaining formalin by means of ammonia gas. There were twenty-three trials made, and in only fourteen were the cultures negative. This method, therefore, fell under his ban.

Sweetnam's. This consists of heating the gut immersed in a 10 per cent. solution of carbolic acid in sweet almond oil over a water-bath at a temperature of 212° F. for one hour, and then using the same solution for its preservation. It was difficult in the bacteriological investigation of this method to remove the oily liquid from the threads, and thus some of the carbolic acid remained in every instance to inhibit to some extent the growth of spores. Even then, however, of nine trials the results were positive in four, which is sufficient to condemn this method.

The *dry-heat* method was originated by Reverdin, and has been used subsequently by Döderlin, Benckiser, Boeckeman, and others. It consists in heating the catgut slowly in a dry-air sterilizer up to 150° C. and holding it there for two hours. Miller had great difficulty with an ordinary laboratory sterilizer to regulate the heat. The catgut by this method is rendered somewhat brittle. It is an efficient method of sterilization, however, as in nearly every case where the threads were heated for two hours or more at a temperature about 140° C. they remained sterile. Of twenty-three trials there was but one positive result when the gut had been exposed for two hours or more to a tem-

perature between 135° and 150° C. The objections to this method are the difficulty in its application and the loss of the gut in strength and pliability.

The last method under consideration—the cumol method of Krönig as modified by Clark and Miller—seemed to be the nearest approach to the ideal. In the bacteriological investigations, out of twelve trials there were no positive results. Not once in these trials were the threads exposed for the required length of time—one hour—to the action of boiling cumol, and in four the exposure was only for ten minutes.

The gut prepared in this manner is strong and flexible; the technique is somewhat elaborate, but it is easy to learn and easy to apply. It may be described as follows: The gut is cut into lengths of 33 cm. and bundles of twelve strands are twisted into rings of a size to fit the heavy glass ignition-tubes used as receptacles. These rings are dried at a temperature gradually raised to 80° C. and held at that point for two hours. This exposure drives every bit of moisture from the material and prevents the gut from becoming brittle, during the subsequent steps of its preparation, from the conversion of the animal tissue into a glue-like substance. The gut is now immersed in cumol, the temperature of which is raised to 165° C., and maintained there for an hour. The process is completed by pouring off the liquid and drying the rings of catgut at a temperature of 100° C. until the excess of cumol is entirely driven off. Finally the rings are transferred to sterile tubes plugged with cotton and stored within heavy glass aseptic jars.

The No. 3 catgut prepared in this way is completely absorbed in ten days. As this is the largest size suitable for general use, Miller has devised a means of preparing the gut, before cumolization, with formalin, through which it requires from fourteen to eighteen days in the tissues for its absorption. It roughens the catgut somewhat, but does not weaken it, and has no other objectionable features. Miller describes his method thus:

“My method is to take the large rolls of catgut as they come from the dealer, cut the silk threads which bind them, place them on a cylinder which they fit loosely, and soak them in the formalin (10 per cent.). After ten hours they are removed from the formalin and placed in running water overnight. They are then wound on a loose, wide gauze roller bandage and dried in the sun before a hot-air draught. The process after this is the same as described in the cumol method.”

It is a pleasure to know that Miller has been able to impregnate the catgut with formalin and thus increase its lasting properties, which largely eliminates the difficulties incident to the early absorption of the simple cumolized gut.

THE OVARY.

Physiological and Clinical Points Derived from the Scientific Study of the Circulation of the Ovary. In a research which I have completed within the last two years, "On the Origin, Development, and Degeneration of the Bloodvessels of the Human Ovary,"¹ certain physiological and practical points have come up for consideration which have greatly interested me and I trust are of sufficient value to be reviewed in this volume.

Innumerable hypotheses have been advanced concerning the differentiation of sex, the latest of which is exemplified by the lamentable downfall of Schenk's theory.

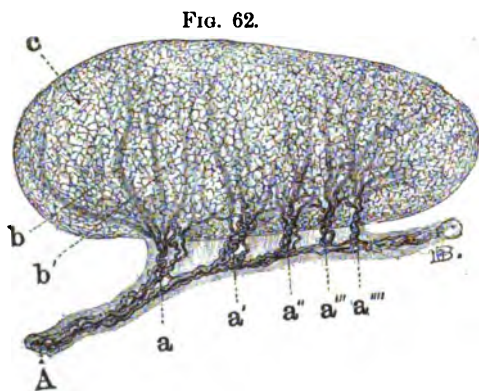


FIG. 62.—Injected ovary of embryo pig, showing the central vascularization by its five branches (arteria ovarice propriae a, a', a'', a''', a'''''), which subdivide into the parallel branches (arteria parallela ovarii b, b, b, b, b), and these finally terminate as a splendid capillary system in the cortex (c).

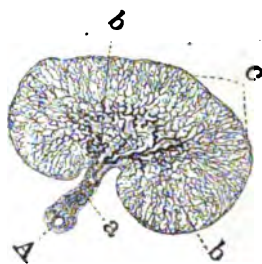


FIG. 63.—Cross section of Fig. 1, showing the scheme of distribution of the branches of one of the ovarian radicals (arteria ovarica propria). The remarkable net-like arrangement in the follicle-bearing area between b and c demonstrates the primitive vascularization of each follicle and the splendid anastomosis between these systems.—*Johns Hopkins Hospital Reports*, vol. ix.

At what point, after the fusion of the spermatic particle and the ovum, sex is actually differentiated, or whether it is differentiated from the very beginning, it is as yet impossible to say. We find, however, in tracing the histological and embryological development of the ovary back to the point where it shows a distinct divergence in its course from that of the testicle, that the histological and vascular arrangement of the two organs are diametrically opposite. We are frequently told that there is a strong analogy between the two organs; nevertheless,

¹ Contributions to the Science of Medicine, and vol. ix. of the Johns Hopkins Hospital Reports.

each year's study shows that there is little or no analogy. The special research, the practical details of which I am about to recount, originally had for its purpose the tracing of the ultimate ramifications of the ovarian vessels from their point of entrance into the hilus of the ovary to the ultimate capillary twigs and then back through the venous system to the ovarian veins. This proved to be an extremely difficult task, for while in external appearance the ovary seems to be more or less non-vascular on account of the alabaster-like whiteness of the cortex, it is, nevertheless, one of the most perfectly vascularized organs. For this reason the ramifications of the vessels, which are extremely tortuous, are followed with the greatest difficulty. In the adult it is impossible, even with the most perfect serial sections, to trace this tangled set of vessels; therefore a descent along the scale of life was made to the infant and thence to the foetus, in which it was still extremely difficult to unravel the scheme of the circulation. Without going into the details of this research, I found at a given point, where sexual characteristics began to be well defined, that the ovary possessed a central, tree-like

FIG. 64.



Dorsal aspect of testicle of pig, showing the distribution of the terminal branch of the spermatic artery. Characteristic of the male sex.—*Johns Hopkins Hospital Reports*, vol. ix.

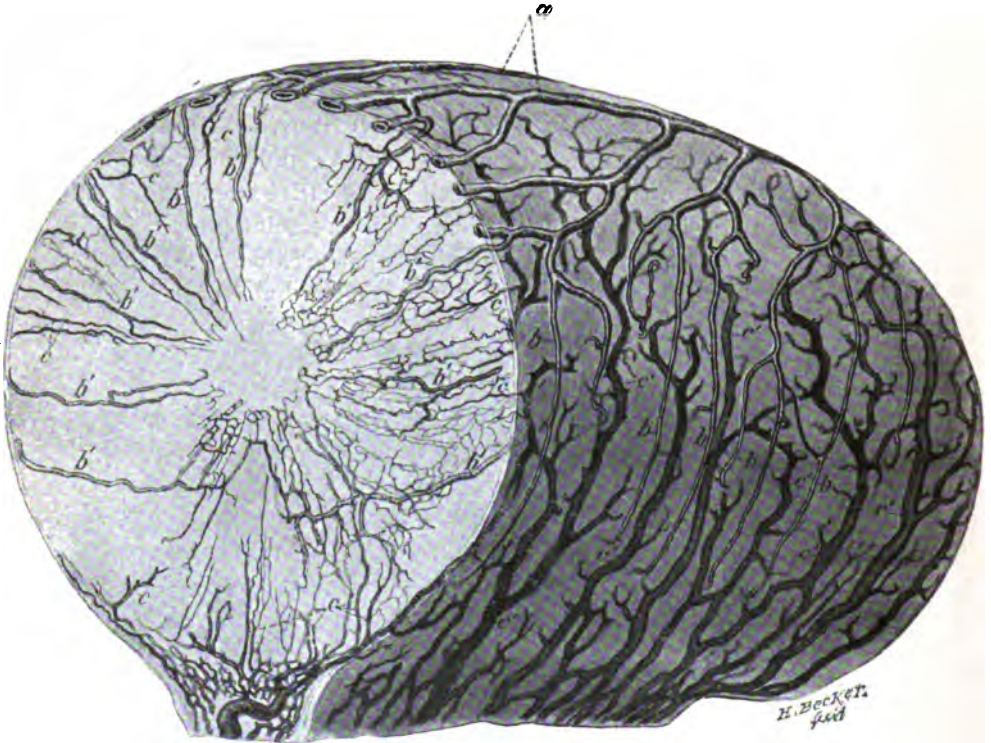
vascularization; the five chief branches of the ovarian artery entering the base and penetrating the centre of the organ, thence branching out into its cortex (Figs. 62 and 63). The testicle, on the contrary, shows the exact reverse of this scheme, the spermatic vessel coursing superficially over the dorsum of this organ, sending girdle-like branches downward along the sides, which in turn give off tertiary, penetrating branches between the seminal tubules (Figs. 64 and 65).

As I shall point out in the consideration of the causes leading to the menopause, I believe that these diametrically opposite schemes of vascularization are the chief factors in determining the comparatively early abrogation of ovulation in women and the prolongation of virility in the male.

The direct progenitors of the ovaries are the Wolffian bodies, which serve, in the embryo, as excretory organs before the permanent kidneys are developed. On the surface of these bodies the peritoneal epithelium becomes heaped up and forms a small hillock. From the Wolffian body

connective tissue, forming the stroma of the ovary, penetrates this hillock in tree-like branches, subdividing the epithelium into myriads of follicles which, as a rule, contains but one ovum. At birth the formation of follicles ceases, and the ovary is covered by a dense, fibrous capsule similar to the tunica albuginea of the testicle. At this time there is enclosed within the capsule of the ovary enough ova, according to

FIG. 65.



Relation of the arteries and veins of the testicle of a pig's embryo. The main branches of the spermatic artery, *a*, send off rib-like branches, *b*, which encircle the testicle. They in turn give off branches at right angles, *b'*, which penetrate to the centre of the testicle, where they form a capillary net. From which small veins, *c*, collect the blood and unite to form larger veins, *c'*, which, running rib-like around the testicle between the arterial branches, converge at the base of the testicle to form the spermatic plexus. Structural changes within the testicle do not therefore impair the integrity of the main vascular scheme.—*Johns Hopkins Hospital Reports*, vol. ix.

Sapy's calculation, to populate a city of many thousand inhabitants. In such animal life as the fish, for instance, we can readily understand that a great surplus must be produced on account of the enormous destruction which occurs after they are deposited in their spawning beds. In the lower animal life provision also must be made for an excessive loss of ova, for they serve as food to marauders of their

own and other species. In the human race, of course, this destruction of ova does not occur, and the question naturally arises, What becomes of the enormous excess?

FIG. 66.

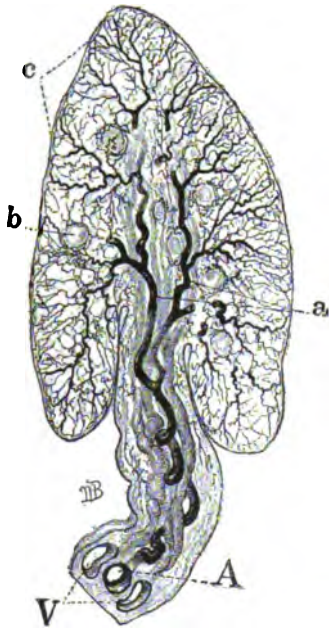


FIG. 67.

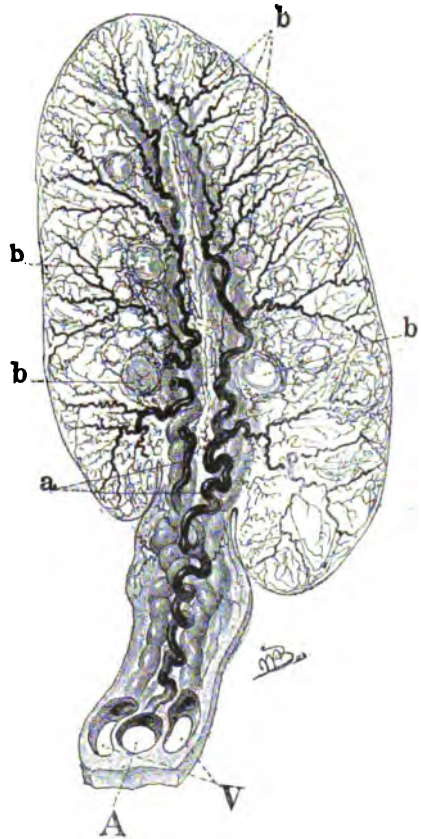


FIG. 66.—New-born child. Vessels injected with lamp-black gelatin. a. Central medullary artery. b. Primitive follicle near centre. c. Cortex.

FIG. 67.—Ovary of a child two years old. The vessels have become more tortuous than in Fig. 66, and numerous follicles lying next to the parallel arteries are in process of evolution. In this picture the mechanical hypothesis of the mobilization of the follicles may be explained. According to this hypothesis the thickness of the cortical zone beyond these follicles is so great that the tendency to the mobilization of the follicles (b) is overcome; consequently they undergo their cyclical changes and obliteration at their primitive sites. The rich anastomoses between the follicular wreaths and cortical branches are seen. The vascularization of the tunica albuginea is now complete.—*Johns Hopkins Hospital Reports*, vol. ix.

At or before the birth of the child these tiny follicles begin to undergo a definite cycle of evolution. The ovum becomes surrounded by hillocks of granular cells, the follicle enlarges to a given point, and then a retrogression takes place; the ovum degenerating and the follicle cavity be-

coming filled by a granulation tissue so perfect that when absorption takes place it leaves little or no residual cicatrix. Quite naturally, those follicles situated nearest the centre of the ovary, where the vascularization is best, are the first ones to undergo progressive changes. In its development, however, it remains within the centre and hence does not rupture upon the surface (Fig. 66). Before the girl even approaches puberty large numbers of Graafian follicles have undergone degeneration within the centre of the organ and only the peripheral follicles remain (Fig. 67). Reaching the age of puberty the peripheral follicles, as they develop, tend to push toward the surface and rupture. This constitutes ovulation, and is usually coincident with the inauguration of menstruation.

Menstruation, according to Sigismund's theory, is simply the miscarriage or discharge of an unfertilized ovum. According to his theory, the ovum is carried by the Fallopian tube from the ovary to the uterus, and, if impregnated, becomes embedded in the mucosa of the uterine cornu. At this period the mucosa is greatly congested and in a receptive state for the ovum. If the ovum is not impregnated it is discharged along with fluid and epithelial debris. This, therefore, constitutes the menstrual flow, and, according to Sigismund, is simply the miscarriage of an unfertilized ovum.

The question naturally arises, Why does ovulation and menstruation occur in the peculiarly cyclical or monthly way? Pflüger, in his work upon the physiological side of this question, advances the view that this periodic congestion is due to the cumulative action incident to the growth of the many follicles. As a result of this continuous action, at last a reflex excitation of the spinal cord is induced, which in turn leads to the pelvic congestion, and this to the extrusion of the ovum from the follicle through intra-ovarial pressure exerted toward the periphery.

The most recent researches upon the nerve distribution of the ovary indicate that there is a sympathetic plexus situated just beneath the capsule of the ovary. If this be true, it can readily be conceived that as a result of this peripheral irritation from internal pressure a reflex action, as described by Pflüger, is induced. This explanation is quite plausible, and until something more definite is proved I am inclined to accept Pflüger's theory.

As to the actual causes, therefore, leading up to the inauguration of ovulation, my researches would seem to show that it is due to the destruction from within out of the follicle, and that this requires an appreciable number of years before the peripheral follicles are reached. When this time comes, which would in general correspond with the age of puberty, between eleven and fifteen years, the follicles are so situated in the cortex of the ovary that when the internal congestion which Pflüger

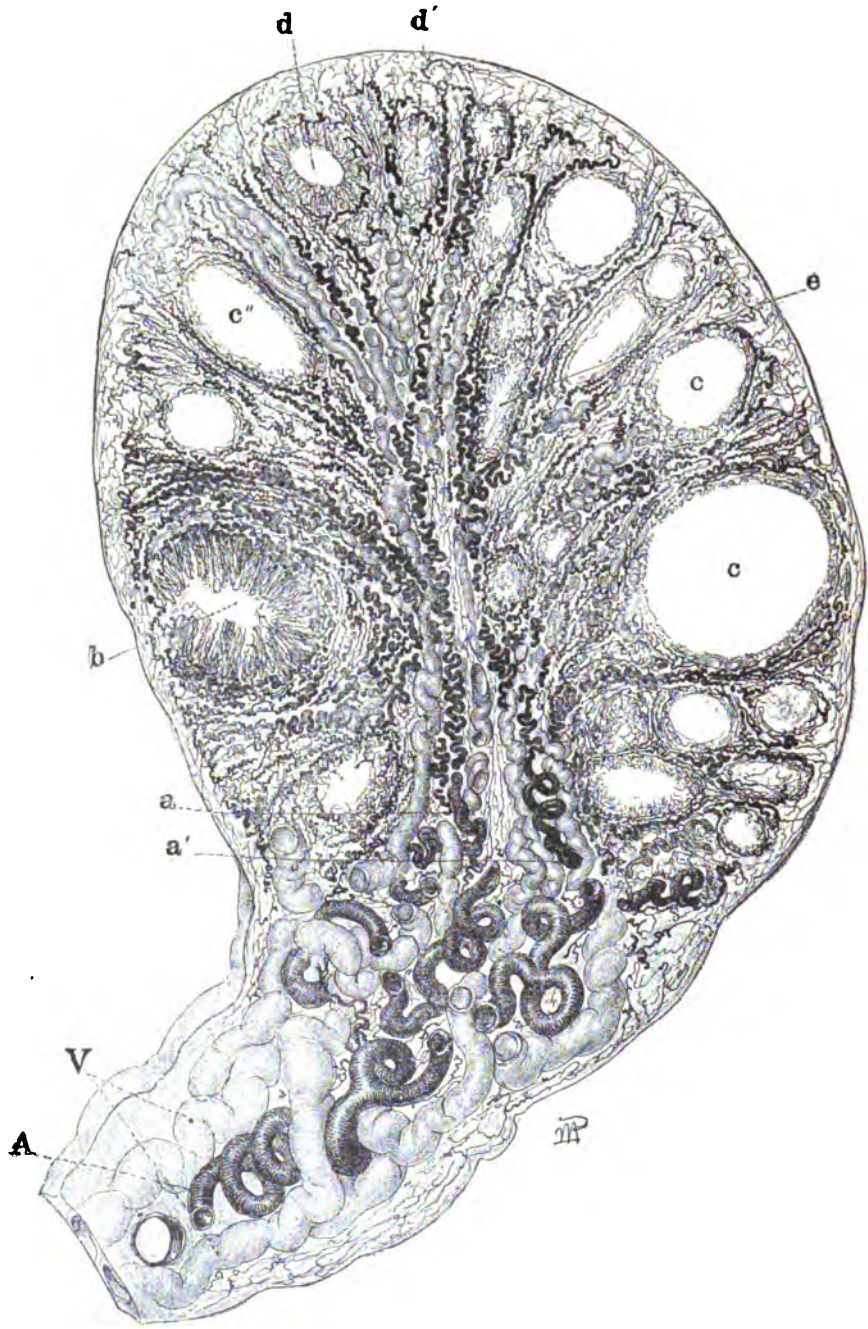
has described occurs the follicle is actually pushed up against the non-vascular tunica albuginea, which gives way through a physiological necrosis, the ovum is expelled and is picked up by the Fallopian tube. After the ovum is expelled a large cavity is left in the ovary, which must be obliterated. Those who have observed at all closely the normal ovary know that not infrequently the follicle may be so large as to occupy half the volume of the ovary. Were this to fail to undergo organization and retrogression, within a short time the ovary would become extensively cystic or greatly hypertrophied. Incidentally, it is worthy of note that a cystic condition actually takes place in cases of peri-oöphoritis, due to the thickening from inflammatory exudate of the periphery, which prevents the rupture of the follicle. I have seen an ovary as large as an orange which internally was not extensively diseased, but had assumed a tumor-like appearance due simply to the failure of the follicle to rupture on account of the great resistance offered by a thickened tunica albuginea.

At this time in the life-history of the girl she may commence to suffer intensely with pains, antedating for a few hours or days the onset of the menstrual flow. This, in general, is symptomatic of ovarian congestion, and may indicate a thickening of the tunica albuginea which prevents the ready rupture of the follicle. Thus, in certain conditions of persistent uterine flow in young women the ovaries are found to be very large, and on section show extensive cystic changes due to unruptured follicles.

There are two general classes of dysmenorrhœa—one incident to a cervical stenosis and the other of the ovarian type just described. The menstrual function should, of course, occur painlessly and with perfect periodicity. While this rule for civilized women may in general obtain, there are, nevertheless, many exceptions to it. It is quite rare, indeed, to find this function unattended with some discomfort, and very frequently there is the most intense cramp-like pain, which totally incapacitates the patient for one or more days before the onset of the flow and for one or two days after it is established. This, without going more into detail of the symptoms, is indicative of the ovarian type of dysmenorrhœa.

The menstrual life of the girl normally is inaugurated without special incident and pursues a regular physiological course (Fig. 68). The follicle maintains its definite cycle—first undergoes development, matures, ruptures, and then becomes organized through a most perfect granulation process (*corpus luteum*). This organization takes place through the projection of radiatory vessels toward the centre of the cavity, between which is the intervening connective tissue or lutein cells analogous to the large fibroblasts seen in granulated wounds. After organization it undergoes

FIG. 68.



Ovary of a girl, sixteen years old. In this specimen all the characteristics of the adult circulation are established. One of the most striking differences noted in this specimen from the preceding ones is the excessive tortuosity of the vessels. In the

retrogression, and the disappearance is so complete that only a very slight or no increase in the stroma finally remains to mark the point where the follicle has been obliterated. Thus the cycle goes on, but as the woman increases in years the stroma of the ovary becomes more dense. The function of the corpus luteum serves, without doubt, to preserve the circulation of the ovary, for in the rapid organization and the almost perfect retrogression of the new-formed tissue the ovary is maintained in a state of anatomical equilibrium. Notwithstanding this provision on the part of nature to preserve the circulation there is, nevertheless, an increasing tendency as the woman grows older toward a greater deposition of fibrous tissue at the site of the ruptured follicle, which is known under the name of corpus fibrosum. In other words, this represents a partial failure on the part of the vascular system to thoroughly remove the excess connective tissue. When, as frequently occurs, the blood-supply is more or less shut off and compressed around the corpus fibrosum it undergoes hyaline degeneration, and is then designated a corpus albicans, or white body.

The physiological law governing menstruation is, unquestionably, analogous to the law which regulates ovulation or rut in lower animals. During the rutting period it is found that the Graafian follicle is mature and on the point of rupture, and therefore that the animal is in the best possible condition for impregnation.

As to the onset of the menopause, or change of life in women, there is a wide variation, ranging between the years of thirty-eight and fifty-five. The average time is forty-two and a half years, but frequent deviations from this average are seen. This gives a possible range of twenty years in which the menopause may occur. On the other hand, the range for puberty is between the ages of ten and seventeen years; very rarely indeed will the young woman go beyond the age of

hilus the branches of the ovarian artery within the hilus (*arteria ovarii propria*) (A) make almost continuous corkscrew twists to its point of division into the parallel vessels (*arteriæ parallelæ ovarii* (a, a'), which are likewise very tortuous and continue so throughout their ultimate cortical branches (*rami corticales*). All stages of development and retrogression of the follicle are noted. b is an example of a typical organizing corpus luteum. The splendid vascular network is growing toward the centre. In its further progression this follicle will be filled in completely and will then undergo atrophic changes, finally leaving, before it disappears, as a last visible trace, an area like e, c, c' represent different stages in the maturation of the follicle. In contradistinction to the earlier types, it is now noted that the maturing follicles are all close to the surface. d and d' represent stages in the obliteration of the follicle which has not ruptured. d is at least half-way obliterated; whereas d' is completely obliterated and is on the point of absorption, the follicular wreath remaining as a black encircling border. e represents a still more complete retrogression, the central vessels of the hyaline body having almost completely disappeared. In the histological specimens such an area appears as a white alabaster-like line. In this specimen the parallel medullary vessels a, a' are well demonstrated.—*Johns Hopkins Hospital Reports*, vol. ix.

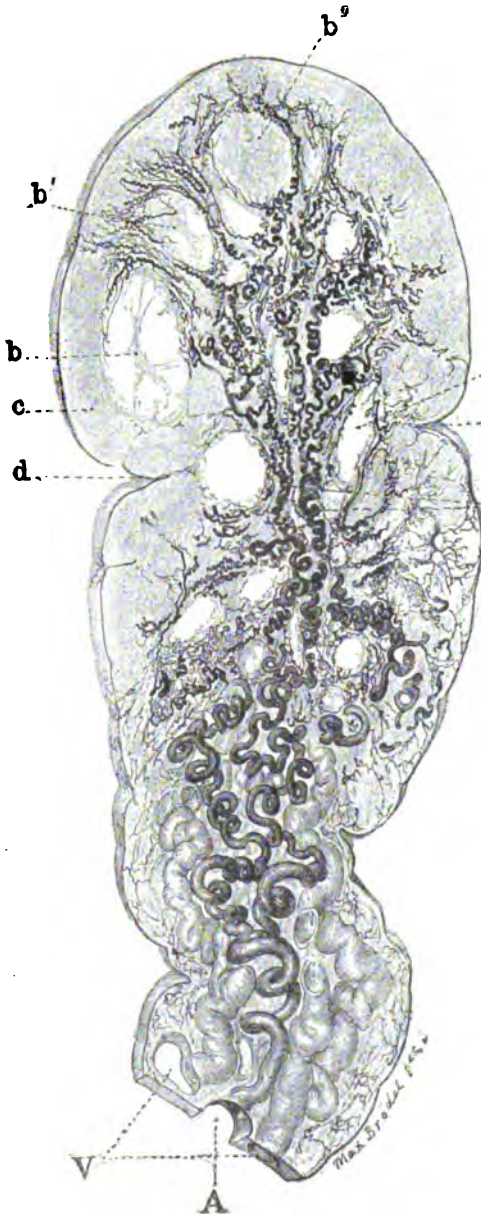
seventeen years, in a temperate climate, before menstruation is inaugurated. Why this wide difference in time between the onset of puberty and that of the menopause? According to the views expressed in my research, this variation is due to the fact that in women, after the menstrual life is inaugurated, many factors intervene which more or less change the character and frequency of ovulation; thus intercurrent diseases like typhoid fever, tuberculosis, chlorosis, severe anæmia, etc., all tend to abrogate, temporarily, the function of the ovary. In this way this organ is more or less quiescent in its cyclical evolution of follicles; quiescent because the perfect carrying out of the maturation of the follicle requires an ample blood-supply. This becomes evident on examining closely the rich, wreath-like vascularization around the follicle, and which is necessary for its maturation, rupture, and organization as a corpus luteum.

The point which I especially desire to emphasize is that with the increase of years in the individual the peripheral zone of primitive follicles becomes less richly vascularized owing to the impairment of the cortical branches of the central circulatory tree. In women who are approaching the menopause there are, in addition to the dense stroma, large numbers of fibrous or hyaline bodies deposited in the zone between the central scheme of vascularization and the peripheral zone of follicles. With the new absorption of fibrous bodies the blocking of the circulation is increased until, according to my view, the primitive follicle is so far robbed of its blood-supply as to be unable to undergo a progressive cyclical change, and thus the onset of the menopause occurs (Fig. 69). Certainly the disappearance of the primitive follicles cannot be accepted as a cause for the menopause, for in women who have long since passed the climacteric ova may still be found. The practical physiological points, therefore, which I would especially bring out in this research are as follows:

1. The wide difference in the vascularization of testicle and the ovary, the first having a peripheral vascular supply and the second a central supply.
2. The continuous functional cycle within the ovary, which leads to the development, maturation, and retrogression of the follicle, regardless of whether it is ruptured upon the surface (ovulation) or simply maintained in its position within the centre of the ovary.
3. Ovulation, which in general is synchronous with menstruation, occurs as a result of the progressive obliteration of the central follicles and the active development of those within the cortex.
4. Through the irritation of the growing follicles there is a cumulative physiological action, which generates a reflex impulse, and this leads to ovarian congestion (rut in animals, menstruation in women). As a

result of the turgescence of the excessively tortuous ovarian vessels the maturing follicle is pushed mechanically against the non-vascular tunica

FIG. 89.



Ovary of a woman, forty-two years old. Death occurred shortly after the menopause. In this specimen the veins and artery of the hilus are still intact and have not undergone degenerative changes. At point a, where the vessels enter the stroma, they appear to be compressed into a narrow area, and all of their cortical branches are in a more or less advanced stage of disorganization, while here and there areas in the periphery are still moderately well vascularized; in general, the entire cortex is very deficient in blood-supply. Numerous hyaline bodies, within which are few or no vessels, are scattered throughout the organ. Deep scar-like pits (d and d') are points where follicles have ruptured, but on account of deficient elasticity and vascularization of the cortex have failed to fill out as they do in the younger woman. b, b', b'', and b''' show various stages of hyaline change in the corpora fibrosa; c, cortex or follicle-bearing zone deficient in bloodvessels.—*Johns Hopkins Hospital Reports*, vol. ix.

albuginea, which undergoes a localized necrosis at one spot (macula pellucida) and ruptures. This constitutes ovulation.

5. The gradual densification of stroma followed later by the deposition of fibrous and hyaline bodies within the ovary lead to the impairment of the circulation, and thus the full maturation of the follicle is prevented, and as a result the menopause is inaugurated.

These points are very largely physiological. What are the practical points which may be deduced from this research? Above all it would appear that nature has made the greatest possible provision for the continuous growth of the follicle, for not only is there the most perfect anastomosis between the ovarian and uterine vessels, but the five branches given off by the ovarian artery, which penetrate the centre of the ovary, closely anastomose with each other. Thus, to put the matter practically, a thrombosis or ligature may occlude the ovarian vessels on one side without the slightest impairment of ovarian function because of the reflux of blood from the uterine into the ovarian artery. On the other hand, the same occlusion of the uterine artery would make no functional change in the ovary, because its blood-supply would still be maintained by the ovarian vessel. This point is practically illustrated in those cases in which the ovaries are densely adherent, and in their removal small bits have been left behind. Even when there is only an infinitesimal amount of ovarian tissue remaining menstruation is maintained. This is due to the fact that notwithstanding the organ may be greatly mutilated nature has made such complete provision for its vascular supply that the follicle may still maintain its cyclical development.

This splendid provision on the part of nature may be taken as a finger-board pointing strongly to the surgeon and gynecologist of the present day, whose tendency may be too radical, to preserve even a small bit of the ovary. When it is possible, especially in young women, to leave even the smallest bit of the ovary behind it should, according to my opinion, unquestionably be done.

There are many other points which might be taken up in this connection, but space forbids.

Transplantation of the Ovary. In a previous communication in *PROGRESSIVE MEDICINE* I called attention to the very interesting experiments on transplantation of the ovary in rabbits by Knauer,¹ assistant in Chrobak's clinic in Vienna. After the publication of Knauer's work one or two articles appeared criticising his conclusions and claiming that the transplantation of the ovary, with the subsequent preservation of its vitality, was an impossibility. Almost simultaneously with the inauguration of Knauer's work on animals Robert T. Morris, of New York, attempted the same procedure in women. In one case the

¹ *Archiv. f. Gynäk.*, 1900, vol. lx., Part 2.

patient, a woman, aged twenty-six years, two years married, had never become pregnant and suffered constantly with severe inflammatory disease of the tubes and ovaries which necessitated their removal. A small piece of the diseased ovary was implanted in the stump of the right tube. About a month after the patient left the hospital she became pregnant, but aborted about the third month, on account, as Morris believed, of pelvic adhesions.

The second case was that of a girl, twenty years of age, who, on account of the infantile character of the uterus, had suffered from suppression of the menses. In this case a piece of an ovary from a woman, aged thirty years, was transplanted into the body of the uterus of the younger woman. Eight weeks later she menstruated for the first time, the flow continuing for ten days. Five weeks later the flow recurred, lasting only five days, and was of normal character. The third menstruation occurred five weeks later and lasted only a day. The fourth and fifth occurred within a space of four weeks and were normal. Morris himself does not know how much weight may be laid upon the second case, because every operation upon the uterus may give rise to sympathetic irritation and thus reinstate or cause the onset of menstruation. In the first case, however, there was no doubt of the fact that the transplanted ovary was functionally active or pregnancy would not have occurred.

A second attempt at transplanting an ovary has been reported by James H. Glass.¹ In this experiment an ovary from a girl, aged seventeen years, was transplanted to a woman, aged twenty-nine years, upon whom ovariectomy had been performed two years previously. On account of the fact that she had suffered very greatly from artificial climacteric Glass decided to transplant an ovary from the younger woman, who was suffering from cicatricial stricture of the vagina. The transplantation was made through an incision from the vagina into Douglas' cul-de-sac, the ovary being sutured into the normal situation. Sixteen days after the operation uterine bleeding occurred for two days; later a perfect menstrual period occurred, the flow lasting for thirty days. Eight months after the operation the patient had recovered her mental and physical health.

The third case of transplantation of the ovary occurred in a patient of Dudley's, who transplanted the right ovary into the fundus of the uterus in a case of double pyosalpinx. The patient continued to menstruate regularly.

As a brief comment on Knauer's work, I may say that when rabbits were employed for the experiments the technique of the operation was carried out with the greatest care. After opening the abdominal cavity

¹ Medical News, April 29, 1899.

the ovary was picked up with the thumb and index-finger and carefully excised with sharp scissors. The broad ligament was opened sufficiently to permit the suturing of the ovary into its folds, leaving, however, a small portion of this organ projecting into the abdominal cavity. In some instances the ovary was transplanted to the abdominal wall, between the fascia and the muscular tissue. Several experiments were thus carried out, from which Knauer reaches the following conclusions: First, that in rabbits the ovary may be successfully transplanted from its normal to some more or less widely removed point; second, the transplanted ovary may continue to functionate as well between the folds of the peritoneum as between muscular tissue; third, that not only is the nutrition of the transplanted ovary maintained, but it continues to functionate, the follicle undergoing cyclical development and the ovary being extruded as usual. After carefully going into the experimental side of his subject Knauer states positively that not only does the ovary continue to functionate in a normal way, but that the ova may become impregnated and the animal give natural birth to its young. One criticism which has been offered to Knauer's work, but which has been successfully refuted by him, is that the transplanted ovary undergoes rapid atrophy. He has shown that in one instance at least the ovary remained in functional activity for more than three years after the experimental operation.

In his explanation of how the transplanted ovary is nourished he believes that the nutrition is maintained through endosmosis, or plasma circulation, until the surrounding tissue sends new vessels into the ovarian stroma. The development of these new vessels and their penetration of the ovary occur rapidly, for in one instance he found new vessels four days after the experimental operation. In several instances, however, the central part of the ovary underwent atrophy. According to Knauer's statement, sometimes a smaller and sometimes a larger part of the ovary degenerates. It is also interesting to state that the large follicles always undergo degeneration and only the small ones are preserved. This corresponds with Ribbert's¹ experiments.

That the ovary has a marked influence in maintaining the normal condition of the genital organs is shown by the fact that in those cases where the transplanted ovary underwent complete degeneration the genital apparatus showed all the characteristic involution changes incident to the climacteric, whereas in those cases in which the nutrition of the ovarian tissue was maintained none of these changes occurred. In this connection I may state that a considerable divergence of opinion

¹ Archiv f. Entwicklmech., vol. vii., Ueber Trans. von Ovarien Hoden und Mamma. Concerning Transplantation of the Ovary, Testicle, and Mammary Gland.

has existed as to the cause of the atrophy of the uterus following the removal of the ovaries. One set of writers believe that it is due to the ligation of the ovarian bloodvessels, while another maintain that there is some occult influence within the ovary which preserves the natural structure of the uterus. That the latter theory is correct is proved by Knauer's experiments, for he has constantly found that the ovarian vessels may be ligated and the ovaries transplanted to some point remote from the uterus, and in case the nutrition of the ovary is maintained in its abnormal position the uterus does not undergo atrophy, but continues to functionate in its normal way.

Another interesting point which has come up in this experimental work bears directly upon the administration of the extract of the ovary. From a clinical stand-point there is little doubt but that in some cases of premature operative climacteric the symptoms may be greatly alleviated by the free administration of the extract of the ovary.

Here, again, there has been considerable dispute as to the actual influence of the ovary upon the so-called secondary sexual attributes—menstruation, monthly congestion, libido sexualis, etc. Thus, one set of observers claim that in removing the ovaries the delicate nerve system is so injured that the rhythmical reflex impulses which are transmitted to and from the uterus and appendages to the nerve centres are interrupted, hence the cessation of these physiological functions. Knauer's experiments once and for all settle this question, for, as has already been stated, if the ovary is nourished in its transplanted position, even if it is remote from the uterus, the secondary sexual attributes invariably will be maintained.

Another interesting physiological point is brought up by this work. Johannes Müller was the first to offer a theory as to the transmission of the ova from the ovary to the uterus. He claimed that it was due to the sweeping movement of the fimbriated extremity of the Fallopian tube, which wafted the ovum from the ovary into the tube and thus into the uterus. Later, Becker (1857) claimed that there was a constant lymph stream flowing from the abdominal cavity through the tube into the uterus, which was maintained by the ciliated epithelium of the tube. In 1894 Lode carried out an interesting set of experiments to prove this point. He introduced into the abdominal cavity of animals the ova of ascarides, and found that they were swept from the abdominal cavity into the Fallopian tube and thence into the uterus.

In Knauer's experiments he has shown that the ovaries, although they may be transplanted into some remote part of the peritoneal cavity, still continue to discharge ova which are finally swept into the uterus. He therefore comes to the conclusion that there is some unknown force within the abdominal cavity which promotes the transportation of the

ova from the ovary to the Fallopian tube. Knauer has found that the transplantation of the ovary from one spot to another in the same animal is usually successful, but is not so successful when done from one animal to another, and he therefore believes that considerable experimentation will yet be necessary to explain the great uncertainty in the latter series of experiments.

In scientific experiments like these the question always arises in my mind as to what is their practical import. Purely scientific experimentation which has absolutely no bearing upon the practical advancement of medicine does not appeal to me. In this series of experiments there is considerable of practical import. Thus it has already been proved clinically that in the removal of myomatous tumors the greatest benefit is derived from leaving the ovaries. In such cases, however, there is no question of transplantation, for if the technical part of the excision of the tumor is properly carried out the nutrition of the ovary itself need not be impaired. In some instances, however, it may be impossible to remove successfully the tumor without the ovaries. What would be the objection, in the light of these experiments, to the transplantation of the ovary thus removed to some part of the broad ligament or the uterus? From Morris', Glass', and Knauer's experiments it would appear to be a feasible plan to replant the ovaries in all such cases. Thus, for instance, in cases of myomatous tumors in young women, where the ovaries are pushed high up on the face of the growth in such a position that it is impossible to remove the tumor without the ovaries. In this event I should carefully protect the ovary, enveloping it in warm gauze saturated with normal salt solution, and after the removal of the tumor suture the ovary into the broad ligament. If this is carefully carried out no degeneration whatever should be inaugurated.

Knauer's explanation as to the maintenance of nutrition in the transplanted ovary seems plausible. This theory is sustained by the research which I have detailed in the preceding pages on the circulation of the ovary. I have pointed out that the ovary is the best vascularized organ in the entire body and that it has several supplies. Thus it does not have one central bloodvessel, as the kidney or liver; but when the ovarian vessel, which has fused with the uterine branch, reaches the base of the ovary it divides into five chief streams, which separately penetrate the ovary and thence break up into a very rich anastomosis, the terminal twigs reaching the tunica albuginea. From a surgical stand-point we know that the smallest vessels are capable of extensive development in case a collateral circulation must be established. The innumerable delicate vessels which leave the surface of the tunica albuginea, if supplied within a reasonable time, may fuse

with new vessels supplied by the peritoneal envelop, and thus the organ may be maintained in a state of functional activity.

Another point which Knauer has dwelt upon is that the ovary is very rich in lymphatics. Lymphatic tissues always transplant easily; therefore we are perfectly right in assuming, without further experimental evidence, that the nutrition of the transplanted ovarian tissue may be maintained by the lymph stream until the new vascular attachments are established.

FORMATION OF THROMBI AND EMBOLI.

Among the most distressing sequels to an abdominal operation is sudden death due to an embolus detached from a thrombosed pelvic vessel. This complication occurs apparently more frequently in Europe than in America, judging from the literature upon this subject. In a series of several hundred abdominal cases I have seen death from embolism occur but twice, once after an operation for carcinomatous cyst and the second time after a hysterectomy for a large myomatous tumor. That it does not occur more frequently is noteworthy because of the large size of the uterine vessels and their easy communication with the iliac vessels. In all operations in which the uterine vein is ligated thrombosis occurs in the vessel back to the main artery and vein; thus it would seem a comparatively easy matter for small fragments of the clot to become detached and swept out into the venous current and thence to the lungs. Sudden deaths after operation are frequently attributed to heart failure. Autopsies upon these cases, however, much more frequently reveal a pulmonary or coronary embolus as the cause of death. When a large embolus is carried through to the lungs it may produce death instantly, the patient falling to the floor and dying as if shot.

As I have remarked in other pages, the German gynecologists speak of a "myoma heart," signifying a degeneration of the heart muscle incident to or provocative of the myoma; therefore they believe sudden death occurs more frequently after hysterectomy for myoma than after other diseases. Burkhard is inclined to take the same view as Strassmann and Lehman,¹ that the myoma is secondary to the heart lesions rather than the reverse. Hysteromyomectomy is always followed by more or less extensive thrombus formation in the uterine artery and veins. This is always shown, as remarked by Burkhard, in autopsies in which death has resulted from some other cause, and is therefore a normal post-operative event. So long as the thrombus remains fixed in the

¹ Archiv. f. Gynäk., vol. lvi.

pelvic vessels no harm results, but there is always more or less danger that any unusual movement—too early getting out of bed, etc.—may lead to the detachment of an embolus which finds lodgement in the lungs. Fortunately, this accident occurs in but a very small proportion of cases in which there is even an extensive thrombosis. If the blood-clot in the vessels is sterile, symptoms are absent or, at most, are very mild. When it becomes infected the clinical symptoms become quite evident. More or less extensive swelling of the local tissue and the leg of the thrombosed side occur. Burkhard finds in 236 myoma operations that thrombosis occurred in 12 cases, distributed as follows: In 132 cases of supravaginal amputation, seven times; in 12 cases of myomectomy, once; in 42 cases of total extirpation by the vagina, twice; in 32 cases of myomectomy by the vagina, no case was noted; in 18 cases of ovariectomy, twice.

One of the interesting cases which Burkhard reports is as follows: A woman, aged forty-two years, was operated upon for intramural myoma. For the first eleven days after operation there was slight elevation of the temperature and quickening of the pulse. On the fourteenth day, while quietly lying in bed, she suddenly became unconscious, breath short and superficial; she was at first pale, then cyanotic; the pulse rapid and feeble; tracheal râles very evident. After twenty minutes of unconsciousness the tracheal râles disappeared, the patient began to sweat profusely, the pulse became slower, although still of small volume. On percussion the right lower lobe of the lung was found somewhat dull and there was little or no entrance of air into this part. On the fourth and fifth days after this attack the patient again fainted, but notwithstanding these grave symptoms she finally recovered, and on leaving the hospital a small mass in the broad ligament indicated the point of thrombosis.

While the majority of Burkhard's cases recovered some died with the typical symptoms of pulmonary emboli. Thus one case, a patient aged forty-five years, was operated upon for a large myomatous tumor. The omentum was extensively adherent to the tumor, requiring a large number of sutures to control bleeding. After the fifth day the temperature was normal, but there was a marked quickening of the pulse. Twelve days after the operation the patient was quite well and entirely free from discomfort. Suddenly, without warning, there was an onset of severe dyspnoea; the pulse became small, soft, and running, and, notwithstanding the most vigorous stimulation, the patient died within fifteen minutes. Outside of the so-called Mahler's sign, which consists of an unusual rapidity of the pulse, there was nothing to give the slightest warning of the approaching catastrophe. In this case the autopsy revealed a pulmonary embolus which had been detached from one of the vessels in the mesentery instead of the usual source, the uterine vein.

Another interesting case, in which the lethal termination was not so rapid, is as follows: A woman, aged forty-three years; supravaginal hysteromyomectomy, March 27th.

March 31st. Slight œdema of the right leg.

April 2d. Œdema less; the pulse and temperature, however, continue somewhat elevated. Copious diarrhœa.

6th. Pulse and temperature high. Diarrhœa still continues. General condition very little altered. No pulmonary symptoms. Wound perfectly healed. Cervical stump movable. No exudate. At this time the urine, which had previously been normal, showed a considerable quantity of albumin and epithelial casts and a few white and red blood-corpuses. Œdema of the right leg still present.

7th. The persistence of the diarrhœa and other symptoms raised a suspicion of typhoid fever, although there were no other characteristic symptoms.

12th. Abdomen distended and tender, with considerable vomiting.

13th. Pain in the region of the right ear and considerable swelling of the parotid gland.

15th. Temperature somewhat less; pulse still very frequent. Diarrhœa continues, but the vomiting has ceased. General condition much worse. Dyspnœa is now quite marked.

16th. Difficulty in breathing greatly increased. On percussion, decrease in the pulmonic resonance over the right side. Œdema of the right leg still present. General condition very bad. In the course of the day the patient became unconscious and died on the 17th of April.

The autopsy showed a rather wide-spread peritonitis, which was most marked about the splenic flexure of the colon. Infarcts of the left lung and hypostatic pneumonia. At the point of most acute peritonitis there was a perforation in the splenic flexure. Numerous ulcers were also found in the colon. In the ilium there was marked hyperæmia of the mucosa, with here and there grayish-yellow necrotic areas, and in the lower end there was cicatricial thickening. Liver and kidneys were acutely inflamed. The inferior mesenteric vein was thrombosed throughout its entire course and out into the vena cava and the splenic vein. There was also a thrombosis in the left iliac vein which extended down into the femoral vein. The pelvic and hemorrhoidal veins were filled with thrombi and there were also adherent thrombi in both renal veins. The field of operation was free from inflammatory changes. It appears from the autopsy that the intestinal lesions were secondary to the thrombi of the mesenteric vessels. The sudden onset of renal symptoms was also unquestionably secondary to the thrombus formation in the renal vessels. Under these circumstances it is quite natural that the possibility of typhoid fever should have been considered.

Convalescence after abdominal section is occasionally complicated by perforation of the stomach, duodenum, and other parts of the intestines. Olshausen especially calls attention to this fact. He says that now and then cases progress satisfactorily for a week, when suddenly a fatal termination occurs from perforation of the stomach or intestine. Burkhard believes these perforations may be due to the lodgement of emboli in the mesenteric vessels.

One point which Burkhard especially desires to emphasize is the frequency of Mahler's sign in cases of thromboses. According to Mahler, there is an undue acceleration of the pulse without coincident rise of temperature or other symptoms in these cases.

Burkhard's conclusions are as follows: First, in four cases thrombi found at autopsy had given rise to no symptoms, death having occurred from other causes. In one of these four Mahler's sign had been present. Second, œdema in one or both legs occurred in six cases, and in the others Mahler's sign was present. Third, in two cases emboli occurred without distinct signs of thrombi. In one case, however, the pulse was abnormally rapid, constituting Mahler's sign.

In a final review Burkhard finds that Mahler's sign was present in 75 per cent. of his cases. To show that this sign is not infallible he says he has observed it in a considerable proportion of cases without the slightest evidence of thrombosis. Certainly, occurring as it has, in 75 per cent. of Burkhard's cases, a rapid pulse without any other apparent cause should make us anxious about the case until recovery is perfect. To offset the dangers of an embolus being detached I insist, in all cases of crural thromboses, that the patient shall remain absolutely at rest in bed. This may be an undue precaution, yet the fear of the possible detachment of fragments of the thrombus is so great that I am not willing to let patients take this risk.

Crural Thrombosis. Henry C. Coe¹ discusses crural thrombosis following cœliotomy in aseptic cases. The cause of this condition is obscure. Some form of sepsis is perhaps the first etiological factor that would occur to the modern surgeon; but the clinical evidence of sepsis in most of these cases is negative, and for the reason that there is practically no mortality in the aseptic cases positive indications of infection cannot be secured.

Other causes have been suggested, viz., traumatism from compression of the pelvic veins in the grasp of the forceps, or, as suggested by T. A. Emmet, undue traction on these veins during operation.

Again, the interruption of the venous circulation by the Trendelenburg posture might bear upon this point. Consideration of these

¹ Transactions of the American Gynecological Society, Philadelphia, 1899.

possibilities does not lead to affirmative conclusions, for if traumatism played an active part, would not the condition in question be more apt to follow the severer operations, in which there are many adherent surfaces to be freed, many pressure forceps to be applied, and numerous ligatures, discrete or *en masse*, to be secured? Contrarily, Coe asserts that thrombophlebitis is comparatively rare "after total extirpation in bad pus cases, hysterectomy, myomectomy, and especially puerperal hysterectomy, where there is always marked dilatation of the vessels of the broad ligaments" and where ligatures and clamps are so freely employed. Most of his own cases belonged to the domain of minor aseptic abdominal surgery. Some of his cases were unilateral salpingo-oophorectomies, some with appendectomies, others with cystectomies, and others with shortening of the round ligaments.

Welch says that the origin of crural thrombosis or phlebitis is not clear. He has observed several such cases following general surgical operations, and particularly after gynecological or other abdominal operations. Usually there is nothing indicative of sepsis before the formation of the thrombosis and nothing afterward but the lesion itself.

Many of these cases can be proved infectious, but in some of them the thrombi have remained sterile. The truth in the matter might be arrived at by a careful anatomical and pathological study of each case, but as their termination is almost uniformly favorable, opportunities for such an investigation are rare.

As bearing directly upon the theories of sepsis and traumatism, Dr. Coe states that in four of the six cases reported he was assisted by his associate, Dr. Jarmon, who attended personally to the disinfection of the abdomen, the instruments, and whatever came directly in contact with the wound.

Their hands were cleansed after the permanganate-oxalic method and rubber gloves were worn.¹

In none of the operations were mass ligatures used; the arteries were tied separately and all cut edges were approximated with catgut, thus leaving no exposed stumps. All of the adhesions in these cases were filamentous and no raw surfaces remained. In one case, of unilateral salpingo-oophorectomy, the thrombosis occurred upon the opposite side.

The patients in question had all been in good general condition before operation; none of them presented varicosities of the veins in the pelvis or in the extremities, nor was there evidence of any other circulatory derangement.

¹ The only weak point in Coe's argument for a faultless technique lies in the statement which he makes in discussing the ligature and suture material: "The catgut prepared by Devens was regarded as above suspicion." Who Devens is and how he prepares the gut is not stated.

In Coe's experience the symptoms of thrombophlebitis suddenly developed at about the tenth day in the course of a perfectly normal convalescence. A slight elevation of the temperature and pulse-rate at this time unaccompanied by evidences of sepsis in the wound leads to the suspicion of a developing phlebitis.

The well-known symptoms of thrombophlebitis—pain, induration, tenderness, and œdema—soon make their appearance in the affected limb.

The pain is entirely out of proportion to the lesion, and is regarded by Sampson as being due to the stretching of the bloodvessel walls. Upon close questioning it was found that sometimes a feeling of stiffness in the affected limb had been the earliest sign of the disorder.

Edema may be so slight as to escape observation unless a careful comparative measurement is taken of the two sides. Induration in the broad ligaments on the affected side, presumably due to thrombosis of veins, continuous with the process in the crural vessels, was noted in three instances. In each it entirely disappeared within a week while the crural thrombosis was at its height.

In only two of Coe's cases was there that characteristic acceleration of the pulse upon which Singer,¹ Mahler, and others lay so much stress as a premonitory symptom. Coe believes Singer's cases belong to a different type from his, and says that Singer's conclusions chiefly apply to puerperal phlegmasia.

The course of thrombophlebitis, in Coe's experience, was one of uniform and rapid recovery; but he says that the experience of German surgeons show that thrombosis following aseptic œliotomy is not to be lightly regarded, for in some instances "the sudden onset of pulmonary embolism, in patients whose previous condition had not caused the slightest anxiety, furnishes a forcible commentary on the uncertainty of the prognosis as well as the absolute helplessness of the surgeon." It is in these cases of pulmonary embolism that the acceleration of the pulse was most persistent and most characteristic.

The essential part of the treatment consists of rest in bed, without manipulation of the affected limb. This recumbent posture should be enforced until all the pain, induration, and œdema have disappeared and the pulse has returned to the normal. Singer, indeed, even insists that the patient should remain in bed three weeks after the pulse drops to normal, but I feel that the danger of pulmonary embolism from getting up before the expiration of that time is so slight as to be disregarded.

¹ Singer has claimed that a study of the pulse in thrombophlebitis is valuable in that it affords a preliminary sign of the disorder. He says it is rapid from the start, and that after the usual post-operative reaction, it does not drop with the temperature, but remains disproportionately fast. It rises sharply about the eighth day, and reaches its acme on the ninth, when the symptoms of thrombosis are first manifested.

CYSTOSCOPY IN WOMEN.

In no place in medicine is the saying "he who diagnosticates well treats well" more applicable than in disease of the bladder and kidneys. During the last decade the examination of the female bladder has been so elaborated and perfected that there is now no excuse for overlooking the cause of any vesical complaint. Our theories have been reversed in some instances and greatly modified in others, as the result of improved and systematic methods of study of the various vesical lesions which occur so frequently in women. It is only necessary to allude to cystitis, the extent of which has been greatly overestimated, to demonstrate the great value of the direct examination of the bladder rather than to depend upon mere clinical symptoms to indicate the nature and location of the pathological condition. Indeed, as Dr. Kelly has demonstrated, it is no longer safe to use the term cystitis, for a universal inflammation of the bladder is of very rare occurrence. In the large majority of cases suffering with severe vesical symptoms only a small area of the bladder is the seat of inflammation. This modification of our views has come from a careful cystoscopic study of cases of chronic vesical irritability. Even when the symptoms are severe the lesions may be so slight as to be almost overlooked.

As infection of the bladder almost invariably occurs from the introduction of septic matter through the urethra, or from the direct extension of a urethritis, that portion of the bladder most likely to be the sole seat of chronic irritability is the trigonum, hence, instead of speaking of cystitis Dr. Kelly has coined the term "trigonitis" to fit this condition. The general surface of the vesical mucosa is smooth, but toward the trigonum, normally, the mucosa is drawn into delicate folds which converge at the urethra. If the infection becomes localized between these folds there may be a persistent trigonitis, which gives rise to quite as distressing symptoms as if the entire bladder were inflamed. As the bladder, with the modern instruments at our command, may be inspected with facility, the haphazard methods of diagnosis and treatment of the past should be discarded, and all cases which do not readily yield to the usual methods of treatment should be subjected to a cystoscopic examination.

There are now before the medical world two chief methods of examination—the direct inspection through tubular specula, as described by Kelly and Powlik, and the method elaborated by Nitze, of inspection through the cystoscope, which carries the electric light directly into the bladder. I have, naturally, always been prejudiced in favor of the Kelly method of cystoscopy, having been associated with Dr. Kelly during the years of the discovery and elaboration of his method. Those

who have only occasionally tried this method claim that it is too difficult to become generally adopted. Unquestionably this method must be studied very thoroughly, and constant practice is necessary to acquire proficiency. But is this not true of all methods of accurate examination? It is unnecessary for me to stand as a champion of this method, for Dr. Kelly, through his skill and splendid investigations in this line, has placed it in an unassailable position. As I found that the Nitze or some modification of his cystoscope was almost universally used abroad, I devoted some study to this subject, and as a result I was most favorably impressed with the Nitze instrument. As a general statement I would say that for a preliminary office examination the Nitze cystoscope is of the greatest value in making a topographical study of the bladder. The disadvantage of the Kelly method is that the knee-breast position is very uncomfortable and often repugnant to the patient, and unless the means of illumination are quite perfect the examination is likely to be unsatisfactory, whereas with a good storage battery or street current a most satisfactory preliminary examination may be made with the Nitze instrument without great discomfort to the patient. This I consider the chief advantage of the Nitze method. For the treatment of vesical lesions, the catheterization and sounding of the ureters, the Kelly method has decided advantages.

In examining patients for vesical complaints I usually employ the Nitze method, in treatment the Kelly. After taking the history of a case, a preliminary urinary examination is made with a view to determining whether there are leucocytes, epithelium, or other pathological matter present. When the results are obtained from the urinary analysis I advise the patient to return for a cystoscopic examination, and for this purpose the latest model of the Nitze cystoscope is employed. There are a number of cystoscopes similar to the Nitze, and some of them perhaps have advantages over the latter, but, on the whole, I look upon it as the best for general purposes.

Krönig¹ has given a most interesting practical review of cystoscopy in women, describing his technique, which is based upon that suggested by Nitze. Nitze's first instrument was naturally rather crude and required many refinements before it became of real value. Others had made attempts to inspect the bladder by direct illumination before Nitze, but he was the first to really establish it upon a practical basis through the use of the electric light.

The source of the illumination is either a storage battery or, preferably, the street current, the voltage being reduced by a suitable transformer. The disadvantage of a storage battery is that it may become

¹ Graefe's *Frauenheilkunde und Geburtshülfe*, vol. iii., Part VI.

exhausted or get out of order at a critical point in the examination and cause considerable trouble; therefore, if the physician's office is supplied with electricity this source should be drawn upon for the illumination.

The cylinder of the cystoscope is about the size of a large catheter, and may be introduced into the bladder, under local anæsthesia, without causing great discomfort. On account of the magnification which may be given by the mirrors the novice should be careful not to overjudge the small excrescences or even the rugæ, which may appear like tumors. The closer the object is brought to the reflecting mirrors the more likely is it to appear distorted, and serious mistakes of this kind have been made by the unskilled observer. A first requisite in making an examination is that the prisms and lamps shall be absolutely clean. The patient is placed in the lithotomy posture and a 10 per cent. solution of cocaine is inserted into the urethra on a pledget of cotton, and another saturated pledget is laid before the external meatus, between the labia. This is left in place from three to five minutes, after which the bladder is evacuated by a catheter and is then washed out once or twice with 200 to 500 c.c. of normal salt solution. For this purpose a glass funnel, with a rubber tube attached to the glass catheter, is used. When the escaping solution is clear the bladder is injected slowly with 500 c.c. of normal salt solution. Through this means the vesical folds are smoothed out and any danger of a burn from the electric light is obviated. After warming the cystoscope through friction in a sterile towel the beak is dipped in glycerin and lightly introduced in the same way as the catheter. A definite routine should be observed in the inspection. As a rule, it is best first to introduce the beak of the cystoscope directly backward until it impinges upon the posterior wall of the bladder. It should only be allowed to rest here momentarily, for with the water entirely displaced it may cause a superficial burn. This accident, however, can occur only after rather prolonged contact and should never happen in a simple examination. When the posterior wall is touched it is slightly withdrawn and the beak is first directed upward, thus bringing into line the superior wall of the anterior hemisphere. It is then gently rotated, first to one side and then to the other, until this part of the bladder is satisfactorily inspected and carefully noted. The beak of the cystoscope is then drawn until it reaches the middle of the bladder, when it is again rotated from side to side and finally withdrawn until that portion of the bladder posterior to the symphysis may be inspected. Having thus carefully gone over the anterior hemisphere of the bladder the cystoscope is again inserted to the posterior wall, its beak turned directly downward, and the posterior hemisphere inspected in the same way. Last of all the trigonum is carefully examined. As a rule, the ureteral orifices are not difficult

to find with the Nitze apparatus ; in fact, in Berlin I have seen students who were novices quickly locate them. If there is pyuria, the mucosa as the possible source of purulent discharge should first be eliminated, after which the attention is directed to the kidneys as the *fons et origo* for the pus ; therefore the ureteral orifices are watched in turn for some seconds, when one may judge as to the nature of the lesion by the character of the urine which is jetted out through the clear salt solution in the bladder. If clear fluid escapes from one side, but is distinctly cloudy or milky from the other, the inference is that the pyuria is of unilateral origin. With the introduction of the salt solution a small amount of air usually finds its way into the bladder. This, however, instead of rendering the examination difficult is sometimes of assistance in locating the dome of the bladder, for these bubbles always appear at the top as opaque globules. It is worthy of note that they may be mistaken for oil globules. The color of the bladder under the Nitze light may vary with the intensity of the current. Under a strong current the red color may appear so intense as to resemble an inflammatory condition. A mellow, bright, white light serves the purpose best, giving the general ground of the bladder a peculiar opaque, ground-glass or alabaster appearance. Coming to the surface here and there are numerous delicate arteries and veins, which form a rather wide-spread anastomosis over the surface of the bladder just beneath the surface of the mucosa. After carefully inspecting the bladder and making a diagnosis, if topical or local treatment is indicated it should be applied through the Kelly cystoscope, with the patient in the knee-breast posture. If the ureters are to be catheterized I very much prefer the Kelly method as being more efficient and much safer so far as the danger of infection is concerned.

In conclusion, I may say that no surgeon or gynecologist who presumes to treat vesical or renal conditions without the diagnostic aid of cystoscopic methods can fail to make mistakes.

EXPERIMENTAL PRODUCTION OF HYDROSALPINX.

Bond¹ has carried out a series of experiments for the purpose of demonstrating the origin of hydrosalpinx and hydrometra.

The cornu of the uterus and the abdominal end of the Fallopian tube on the same side were ligated, and in a few weeks a typical hydrosalpinx was produced. The accumulated fluid corresponded with that found in the hydrosalpinx of women.

In the same way double ligation of the uterine cornu produced hydro-

¹ London Lancet, July 22, 1899.

metra. The simple ligation of the uterine end of the tube would not lead to the accumulation of fluid.

In conclusion, Bond takes radical ground against the theory that the hydrosalpinx is simply the end product of an infectious inflammation. He believes that it occurs as a result of the closure of the tube and its distention through the accumulation of the fluid normally escaping into the tube.

PELVIC MASSAGE.

This method of treating of gynecological diseases has had very earnest advocates and also very energetic opponents. Olshausen,¹ who is of a conservative turn, discusses this subject more in a defensive than in an offensive spirit. At the meeting of the German Gynecologists at Leipzig, in 1899, he strongly discredited the treatment of retroflexion by massage. His remarks have been widely misquoted, and therefore he deems it necessary definitely to define his views concerning pelvic massage.

Through general massage there is an increase in the body temperature, the blood-pressure is raised, the massaged part or organ increases in volume, and metabolism is increased. The resistance of the muscular tissue is likewise intensified and the tendency to fatigue is decreased. While general massage may cause these physiological phenomena, Olshausen claims that they are not of great value when applied to gynecological conditions. He admits that the free flow of blood through the massaged organ will increase the metabolism and in this way assist in the removal of pathological products, but he strongly antagonizes Thure Brandt's statement that pelvic massage will induce a flow to the pelvic organs and through a special manœuvre will carry the fluids away. When we remember that Brandt was only an officer in the Swedish army and really knew little or nothing of the pathological conditions which he assumed to cure by massage, we are not surprised at such unscientific statements. Brandt even went so far as to claim that he was able by massage to increase the flow in the lymph tracts as high as the thoracic duct. In the beginning of his article Olshausen emphatically states that he is not an opponent of massage, but believes it is of limited value. He states that the indications for this method of treatment have in the last ten years been greatly overestimated, and that in some conditions for which it is advised it is not only irrational, but extremely dangerous.

Massage, according to Olshausen, does not consist in the forcible breaking up of adhesions about the pelvic organs, as employed, for in-

¹ Centralblatt f. Gynäk., 1901, No. 3.

stance, by Schultze in the reposition of an adherent retroflexed uterus, but is a definite bimanual manoeuvre, as suggested by Brandt and elaborated by other investigators.

In lateral deviations of the uterus due to the contractions secondary to a pelvic cellulitis he believes good may be accomplished by vigorous bimanual massage acting coincidently on the fundus and the cervix. Such conditions, however, are very rare, for they are usually complicated by other malpositions of the uterus or by inflammatory disease of the appendages. In the true sense of the word this stretching of the ligaments and adhesions through strong bimanual effort is not, according to Olshausen, massage, for the latter consists in pressure and rubbing and other delicate manual manoeuvres.

Concerning retroflexion and prolapsus, Olshausen unhesitatingly says that he does not believe there is a case on record which has been cured by massage, for to attempt to change the position of the uterus by this means "is equivalent to fighting a windmill with a lance." This statement refers especially to old cases of retroflexion. He does not doubt that in puerperal cases, when the uterus is heavy, congested, and retroflexed, massage may not only reduce the size, but replace the uterus to its normal position. In support of his negative attitude he refers to 137 cases reported by Prochowink, in which only seven could be said to have been benefited by massage. He excludes Brandt's cases because they are too meagrely reported and the duration of the cure was frequently not noted. In cases of adherent retroflexion Olshausen believes that the release of the adhesions may be beneficial, for the uterus will then tend to return to its normal position. Six cases which were accompanied by pelvic exudate, reported by Dursen, were, according to his statement, relieved by massage. Olshausen, however, draws a distinct line between simple retroflexion and retroflexion accompanied by pelvic exudates, for in the latter cases he believes that the malposition is likely to be secondary to or coincident with the infiltration, and on its removal the uterus will right itself. Massage, therefore, assists in the removal of the pelvic exudate, but does not actually cure the retroflexion. Brandt and others believe that through massage muscular tonicity is restored, and in this way the uterus is reposed. In opposition to this Olshausen coincides with Fränkel, who says that no muscle, whether voluntary or involuntary, which has been overstretched for years, can be stimulated to contraction by strenuous mechanical stretching, because it is usually so atrophied that it remains permanently inactive. In the summer and fall of every year Olshausen sees almost numberless cases of retroflexion, returning from various watering-places, which have been treated energetically by massage for six or seven weeks. These cases have frequently been under the most skilful hands and are con-

vinced that they are cured of their retroflexion, and are therefore puzzled to know why their symptoms persist. They frequently state that they have become extremely nervous from the treatment, and in some instances several months have elapsed before they have recovered their nervous equilibrium. In almost every instance of this kind Olshausen has found the uterus still in retroflexion. After seeing possibly one hundred such cases it is natural that he should be skeptical as to the benefits derived from massage.

The cure of endometritis by massage, according to Olshausen, is absolutely out of the question. Many cases of chronic metritis are said to have been cured by massage; but, again, Olshausen is skeptical, for he says in many instances the so-called hyperplasia of the uterine wall is without doubt due to the presence of myomatous nodules, and these cases are certainly not suited for massage. Referring to the treatment of recent hæmatoceles by this means, he says that no intelligent man would for a moment consider such a procedure. The larger hæmatoceles can only be handled safely by surgical means, and the smaller ones should be left to spontaneous reabsorption. The only possible cases amenable to this treatment are those in which the blood is collected in the broad ligament, and they seldom reach a size sufficient to require treatment. Having so positively discarded massage in the treatment of simple malpositions of the uterus, Olshausen answers the question as to what cases are suitable for massage by saying that pelvic exudates which result from puerperal infection, or primary infection of the tubes, constitute almost the only condition. This statement is immediately qualified and guarded by the advice not to employ it in every case of pelvic exudate. It is of special moment to discover, if possible, the etiology of the exudate. The Fallopian tubes must be carefully examined to determine whether they are the source of the cellulitis. It may be impossible to discover by palpation the condition of the Fallopian tubes in chronic cases. If it is determined that the exudate arises from acute infection of the tubes, massage should not be thought of, and only after the inflammatory process has long since disappeared does one dare to institute it; also, massage is contraindicated while there is a tendency for the exudate to disappear spontaneously. If this rule is disregarded acute peritonitis may be set up by the massage.

To briefly summarize the chief points of this part of Olshausen's article, one may say that only the pelvic exudates, and never the tubal collections, should be treated by massage. The application of this treatment to hydrosalpinx or pyosalpinx is, according to Olshausen, absolutely culpable. Rare cases of hydrosalpinx are seen, with a recurrent tendency for the aqueous fluid to be discharged into the uterus, which may be cured by massage; but these are so difficult to distinguish from

other forms of hydrosalpinx that they should not be taken into consideration in arriving at conclusions concerning the value of this treatment.

In conclusion, Olshausen makes the following statement: Massage is indicated for pelvic exudates which fail to be absorbed and no longer show any signs of inflammation. Massage is only likely to be of value when the exudate may be pressed between the vagina and abdominal wall. Tubal enlargements are seldom if ever benefited by this form of treatment. Only those cases of recurrent hydrosalpinx in which the fluid is periodically discharged into the uterus should be submitted to massage. When the wall of the tube is thick and there is a surrounding pelvic exudate massage should be directed only to the removal of the infiltration and not to the relief of the tubal disease. Peritoneal adhesions, hæmatocele, malpositions of the vagina and uterus are not suitable for massage, although anomalous positions may occasionally be corrected by the removal of pelvic exudates.

URETERAL COMPLICATIONS INCIDENT TO PELVIC TUMORS AND INFLAMMATORY DISEASES OF THE APPENDAGES.

J. H. Knox¹ calls attention to the functional and organic changes in the ureters consequent to encroachment upon their calibre by new-growths. He finds that carcinoma is the most frequent cause of these changes, and while this fact is well recognized by gynecologists, ureteral complications in cases of myomatous tumors of the uterus have scarcely been considered.

Ureteral obstruction from myomata may occur at any point along the course of the ureter, but is more frequent in the true pelvis. The reason is obvious, for in the pelvis the growth is fixed within bony walls and becomes incarcerated there; while, except in tumors of the largest size or adherent ones, the more yielding abdominal walls present an increase of intramural pressure to the same degree.

Beside direct pressure, the ureters may be obstructed by tumors originating beneath their vesical terminals; in these instances the ureters are spread out upon the surface of the growth as it enlarges. By vagaries in development a tumor may surround the ureter or bury the same within its mass. Adhesions must not be forgotten as secondary and additional sources of compression.

Knox cites twenty-five cases in which the effect of ureteral obstruction varies from such slight distention of the ureter above the constriction as scarcely to be observed to extreme examples of hydroureter, hydronephrosis, and their sequelæ in nephritis, pyoureter, and pyelo-

¹ American Journal of Obstetrics, April, 1900.

nephrosis. He dwells upon the frequency with which infectious processes follow ureteral distention by noting its occurrence in twelve of his twenty-five cases. These figures, of course, do not indicate the true proportion, for only the severer cases appear in the literature. The tumors in all of the cases under observation must have been large, for the smallest one described was of the size of two fists.

No deductions are drawn concerning the relation between the seat of the growth and its liability to cause ureteral pressure symptoms. Most of the cases reported show involvement of the whole uterus; then follow in order of frequency the posterior wall, the anterior wall, and the cervical region.

The pathological changes which follow narrowing of the ureteral calibre are first of all a dilatation of the canal above the point of obstruction, producing a hydroureter. With this there is always some distention of the renal pelvis. In severe cases the latter may result in an atrophy of most of the kidney substance, so that only a small portion of the cortex is spared and the kidney is converted into a thin-walled sac.

The cystic fluid in cases such as we are describing loses its urea and other characteristic ingredients and becomes watery in its composition. Thus the urine from the affected ureter is of a lower specific gravity and contains a smaller percentage of solids than that of the sound side or the mixed urine. When the obstruction is not extreme there may be only a slight parenchymatous nephritis, which later on may pass into chronic interstitial nephritis (contracted kidney). The assertion that the ureters and kidneys under any of these conditions are especially susceptible to infection is unquestioned. Thus pyoureter, periureteritis, pyelitis, and pyelonephritis may arise. In considering the symptomatology of the cases the author found few characteristic symptoms of ureteral pressure. Most of the symptoms have been those incident to the development of any benign new-growth of the uterus.

Urinalysis has scarcely ever shed much light on the diagnosis, for in many of the minor cases the report was "negative." In some instances there was pus, in one case blood, and in several others albumin and casts. There were noted, however, some anomalies in the passage of urine, as indicated by the words "some difficulty in urination." In more marked cases there was vesical tenesmus, and large amounts of urine were voided after the application of hot cloths.

In two of the cases reported by Knox there was marked retention; a few drops of urine only could be voided, and that after much straining. Complete anuria has been noted in several cases, and death from uræmia occurred in three.

None of these symptoms positively indicate hydroureter or analogous

conditions, but merely serve to remind us when they appear in connection with a pelvic tumor of possible ureteral complications.

The diagnosis of ureteral compression may be difficult, and in the moderate degrees often is impossible. Its continuance may be productive of much evil; the question of diagnosis is therefore important. Catheterization of the uterus will reveal the presence of a stricture and its exact location; the existence of hydroureter, as shown by a rapid discharge of fluid as soon as the obstructed area has been passed; the presence of calculi (for this the instrument must be tipped with wax); kidney and ureteral changes, as discovered by an analysis of the urine obtained from the affected side. Pain may be severe when there is distention of the renal pelvis and is often intermittent, corresponding to the increasing pressure of the accumulating urine.

Knox asserts that in moderate grades of kidney dilatation the organ is sometimes palpable, and that in extreme degrees a fluctuating tumor of variable size may be felt in the lumbar region. This, he says, is almost pathognomonic of ureteral obstruction. "In doubtful cases, when the condition of the patient warrants operative interference, an exploratory celiotomy should be performed and the exact relationship of the ureters thoroughly investigated. In consideration of the fact that in the past most of the cases of moderate ureteral pressure by myomatous masses have been overlooked, and that in many instances disastrous results have followed, the inspection and palpation of the ureter should be a routine procedure, if there is no contraindication, whenever the abdomen is opened."

TREATMENT. The treatment of these ureteral alterations is but a part of that of the tumors which produce them. Three lines of treatment are presented by the author.

Expectant. This can be adopted only when the myomatous uterus is causing no inconvenience. If a definite interference with the ureteral function is discovered the treatment becomes either palliative or radical.

The first of these is only permissible when the compression of the ureters is of slight degree and is not increasing. It includes the application of moist heat and ureteral catheterization for temporary relief; the exhibition of drugs to stimulate the elimination of urine and to keep up the general tone of the patient.

When there are contraindications to operative interference and the tumor is not adherent it may sometimes be pushed from the pelvis into the abdominal cavity by pressure through the vagina or rectum.

Radical treatment consists in the removal of the obstructing growth after one of the several methods in vogue.

If for any reason the tumor or the obstruction cannot be removed, and anuria results, the ureter must be opened above the constriction

and its edges sewed to the abdominal incision, or the kidney itself "should be drained." If infection of one kidney is persistent, after removal of obstruction to its ureter and repeated lavage of its pelvis, surgical intervention should be adopted, provided the opposite organ is little affected.

Pyelonephrosis of marked degree is best treated, when possible, by nephrectomy, but one must often be satisfied with evacuation and drainage.

MYOMA OF THE UTERUS.

Conservative Treatment of Myoma of the Uterus. Until quite recently cases of myoma uteri have been submitted without question to total hysterectomy, including the removal of the ovaries and tubes. Of late a conservative tendency has been advocated not only in the limitation of the operation, when possible, to the mere removal of the tumor, and in case this is impossible to at least the preservation of the ovaries. The latter step has, without doubt, relieved patients of a great deal of unnecessary suffering which comes as a sequel to the total removal of the ovaries. Whether the ovary has a physiological secretion which is essential to the preservation of the feminine equilibrium it is impossible to say, but there can be no question that some agent within these organs has this specific function; therefore, when it is possible to preserve the ovaries the surgeon should leave no stone unturned to accomplish this end. Olshausen accepts this view without question, for he says that in cases, for instance, where vaginal hysterectomy has been done for cancer of the uterus in which the ovaries have been left behind, as is customary in these operations, the patients have complained little or none from the symptoms incident to a premature menopause. He therefore unhesitatingly advises that one at least, if not both, of the ovaries be left behind in cases of supravaginal hysterectomy for myomatous tumors. He also strongly advises the enucleating of the tumor without removal of the uterus if this course be possible.

He details a case in which a woman, aged thirty-one years, had a large myoma of the cervix and, in addition, a smaller one of the broad ligament. The tumor had grown in such a way as to push the uterus upward into the abdominal cavity. After the abdomen was open Olshausen felt that it was possible to remove the tumors without the uterus, ovaries, and tubes. To accomplish this he split the capsule of the tumor between the uterus and bladder and gradually enucleated it along with the tumor of the broad ligament. The enucleation left a large cavity, which communicated with the vagina through the opening between the cervix and the bladder. This cavity was packed with gauze through the

vagina and the opening in the broad ligament through the vesico-uterine peritoneum, and was closed with continuous catgut suture. At the completion of the operation the ovaries, uterus, and tubes had sunk back to their normal position in the pelvis. The patient made an uninterrupted recovery.

Such cases as these are evidences of extremely good surgical judgment. The man who works by the rule of thumb in any abdominal operation must necessarily be a poor surgeon. There is no rule of thumb, for in every instance judgment should be exercised if the best results are to be obtained. By such judicious manœuvres as those advised by Olshausen, Ramsey, and Kelly the uterus and its appendages may be preserved in many cases which hitherto have been subjected to total hysterectomy. These cases are also very strong arguments in favor of strict specialization of abdominal surgery. The general surgeon, who must give his attention to many diverse conditions, cannot go into the minute detail of these cases in the same way as the specialist.¹ He may remove the tumor, with the uterus and ovaries, and the patient recover; but how much greater surgical triumph to remove only the tumor, leaving the ovaries and uterus intact. All of this line of conservatism has been elaborated by the gynecological surgeon.

Ultimate Results in Hysteromyomectomy. The American surgeon is, unquestionably, excelled by none in dexterity, careful judgment, and careful observation of his case immediately after operation; but it is a lamentable fact that in the study of post-operative results little has been done in this country. How few American surgeons follow closely their cases after they have left the hospital wards! In many instances if patients are allowed to drop out of sight for six to nine months they are traced with great difficulty. This is due to the fact that the poor population are nomadic, travelling from place to place, and within a comparatively short time after they have left the hospital may have removed to some other city and can no longer be traced. It is only by frequent communication with these people and constantly looking them up that we are able to keep accurate account of post-operative conditions. With the many clinics in all of our large cities patients frequently are not especially loyal to the clinic in which the operation was performed, and, therefore, drift into the nearest dispensary for treatment in case anything arises which requires subsequent attention. Some surgeons assume that because patients do not return they are cured. This, however, is a serious error, for in many instances the very fact that they are not cured leads them to seek other professional advice.

¹ Zeit. f. Geb. und Gyn., 1900, vol. xliii., p. 1.

Burkhard¹ has recently reported on the results in 104 cases of operation for myoma of the uterus. Of these 67 were examined by him, 27 were heard from by letter, and 3 communications came from physicians. The operations are grouped under three headings:

1. Supravaginal amputation and total extirpation of the uterus, 62 cases. In 51 of these both ovaries were removed. In 10 one ovary and in 1 both ovaries were left behind.

2. Vaginal total extirpation, 21 cases. Removal of both ovaries in

5. Preservation of one ovary in 8. Preservation of both ovaries, 8.

3. Ovariectomy for decreasing the size of the uterus.

As a result of this extensive review of cases Burkhard reaches the conclusion that unless there is some definite indication for the removal of the cervix, such, for instance, as malignant degeneration, pyogenic infection, etc., no harm can possibly occur from leaving it behind.

When a simple castration is performed bleeding incident to the presence of the tumor usually ceases provided all of the ovarian tissue is removed; likewise the tumors do not tend to increase in size; on the contrary in most cases they undergo atrophy. The menstrual molimina only seldom occur after the removal of both ovaries; more frequently when one or both ovaries are retained. In cases of supravaginal amputation when the ovaries are left behind disagreeable climacteric symptoms are much less frequent. Excessive nervous irritation does not occur so frequently and is less noticeable when both ovaries are retained. Psychological disturbances of serious grade have not occurred in Burkhard's series of cases.

As a result of his review he reaches the conclusion, with which I am in full accord, that in every instance where it is possible sound ovaries should be retained, because the post-operative disturbances incident to premature menopause are thus avoided. I cannot pass over the latter point without calling attention to the fact that Hager's assistant reported a series of cases last year in which he disagreed with these, and the excellent conclusions of Abel, who reported a large series of cases from Zweifel's clinic. The weight of clinical evidence is unquestionably confirmatory of Abel's and Burkhard's conclusions. It is seldom, indeed, that it is necessary to remove the ovaries, even when the tumors are very large. In fact, I hardly recall an instance within the last three years where I have been forced on account of the anatomical changes incident to the growth of the myoma to extirpate the ovaries. With me the question has gone beyond the stage of experimental observation and is an established fact, for the characteristic symptoms may be evanescent or patients may not suffer the slightest

¹ *Zeit. f. Geb. und Gyn.*, 1900, vol. xliii., p. 1.

post-operative disturbances if the ovaries are left behind. Abel, in his paper, also suggests that as much of the cervix with its uterine mucosa as possible should be left behind in conjunction with the ovaries, for in this way a continuance of menstruation is possible in a certain number of cases. Menstruation depends upon the presence of the ovaries and occurs very seldom without them. On the other hand, menstruation will not occur, even if the ovaries are intact, if there is no uterus. The mere abrogation of menstruation, however, is not attended with disagreeable symptoms, but the distressing flushing, fainting sensations, and other disagreeable sequelæ following the total removal of the ovaries may become a serious menace to the patient's health and happiness, thus defeating the otherwise good results of the operation. It is therefore my standing rule to so order a hysterectomy for pelvic inflammatory disease or for myomata that at the completion the ovaries have been left partially or wholly intact.

Circulatory Disturbances Incident to Myoma Uteri. A theory which has been rather extensively commented upon by the German magazines of late concerns the etiology of myoma uteri. According to this theory, the cardiac changes so frequently noted in cases of myoma uteri antedate and are productive of the tumor growth. Sudden deaths after hysteromyomectomy are attributed to the cardiac disease in these cases. This complication appears to be one which is greatly feared by German gynecologists. There is in this respect certainly a wide difference between the immediate post-operative results in this country and those in Germany. Sudden death from heart disease is very infrequent in this country, and we very little fear this complication. The fact that such a small percentage mortality occurs from cardiac disease leads one to believe that this new theory as to the origin of myoma uteri has no basis in fact.

I have recently analyzed a considerable number of cases of histories of myomata, and very rarely indeed have I found serious cardiac symptoms, and when present they appear to have been coincident rather than incident to the tumor growth. Unquestionably in cases of dense tumors of long standing there must be some impairment of the heart muscle as a result of increased work incident to forcing blood through this dense tissue. This physical condition has impressed some of the German observers so strongly that they rather enthusiastically champion the new theory.

As an interesting case of hereditary heart disease associated with fibroid tumors the following report of Spannochì¹ is of interest: The patient, a Jewess, aged forty years, had borne no children. Associated with a fibroma of the uterus there was a slight cardiac lesion. She had

¹ *Annali d'Obstet. et Ginec.*, 1899.

twin sisters, one of whom died of some cardiac affection complicating a fibroma of the uterus; the other one also suffered from a fibroid tumor, but operation was deemed inadvisable on account of serious mitral disease. The mother, a few of her aunts, the grandmother, also some of the relatives of her grandfather, had suffered with abdominal tumors. The mother and grandmother seemed to have had cardiac disturbances. From this history the writer draws the conclusion that there is some embryological condition of the vessels of the uterus which tend to produce a thickening of the uterine muscle which in turn may form a myoma of the uterus. This writer assumes that tumors of this description are more frequent among the negroes than the whites, and he also notes the same tendency among the Hebrew women. This fact he attributes to the intermarriages which occur so frequently among these races. I report this case simply as an interesting example of apparent heredity influencing the growth of these tumors. From my own observation, however, I do not believe that there is a hereditary tendency to fibromyomata.

Recent Improvements in the Technique of Hysteromyomectomy. There is, perhaps, no operation in surgery that has evolved so satisfactorily as hysterectomy for fibromyomatous tumors.

First, simple ovariectomy was done to inhibit the growth of the tumor. This step was soon superseded by hysterectomy, in which the elastic ligature and the suspension of the uterine stump in the abdominal wound were employed to prevent serious hemorrhage; then came the next and still more advanced step in the technique, which consisted in the amputation of the uterus at the cervix, catching and ligating the uterine arteries, and dropping the stump, enveloped by peritoneum, into the pelvic cavity. With this advance the dangers of local suppuration, the risks from phlebitis, the probability of hernia, and the necessity for constant surgical attention incident to the frequent dressings of the local wound were largely obviated.

Those operators—and there are still some at the present day—who feared post-operative hemorrhage when the stump is dropped, looked upon this innovation as a retrogressive rather than a progressive step, but time has proved conclusively that sound surgical principles were involved in this improvement, and it has, therefore, stood thoroughly the severe tests which have been put upon it.

Increased experience in operations upon the innumerable bizarre forms of myomatous tumors, many of which may be deeply wedged in the pelvis, making access to the uterine artery excessively difficult, has suggested further improvement with a view to reaching these vital points as easily and as quickly as possible. To this end Pryor, in 1894, described a new and rapid method of dealing with intraligamentous fibromata

which, in its general plan, was similar to that described a little later by Howard Kelly under the title of "Hysterectomy from Right to Left and Left to Right." The chief points claimed for these operations was the easier and quicker ligation of the uterine arteries. Briefly stated, the Pryor-Kelly method comprised the following steps: First, the ligation of the ovarian artery on one side, then the round ligament, then the separation of these structures from the uterus, followed by splitting open the broad ligament and the ligation of the uterine artery. This being accomplished, the uterus was drawn strongly upward and rapidly cut from the cervix until the uterine artery of the opposite side was exposed and clamped. With the ovarian and the uterine arteries controlled the uterus is pulled up out of the pelvis and the remaining ovarian vessels clamped.

This, unquestionably, has been a very great improvement in technique, simplifying cases which hitherto have been excessively difficult. This method has proved very effective in cases of fibromyomata associated with dense adhesions and pelvic inflammatory disease of the appendages, and no doubt many lives have been saved in this way which otherwise would have been sacrificed by the older methods. Kelly has quite recently advocated still another step which, at first glance, appears also to be a distinct advantage in certain classes of cases. In his article,¹ entitled "The Evolution of My Technique in the Treatment of Fibroid Uterine Tumors," he describes the various evolutionary stages through which he advanced, and concluded with a detailed description and illustration of his new method of dealing with these cases. The plan first suggested by Pryor and Kelly is, according to the latter, applicable to all ordinary cases in which the uterine arteries and veins are not extremely displaced by being lifted and spread out on the surface of the tumor or pushed back and to one side, where they can be found only with difficulty.

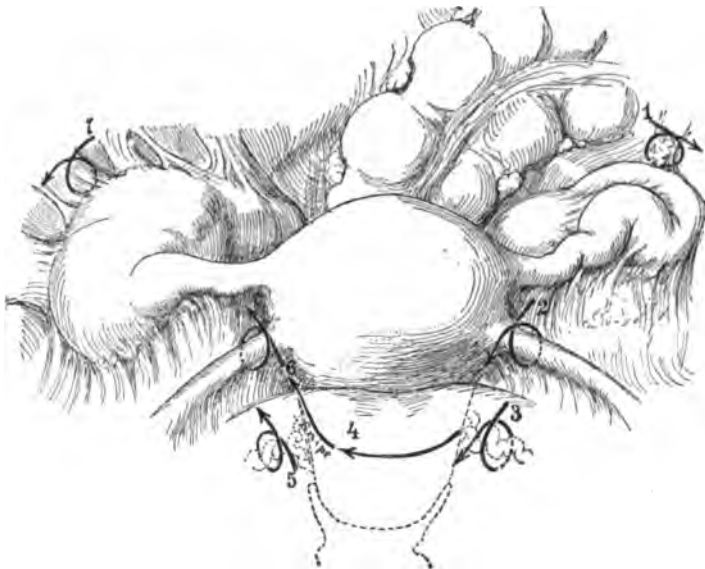
The chief argument in favor of Kelly's new method is that hemorrhage is much more rapidly controlled. There are three ways, according to this writer, of dealing with these difficult cases: First, by a median sagittal bisection of the uterus with the tumors; second, by coronal bisection of the uterus with its cervical portion; third, by a bisection of the tumor alone. Following this statement of the methods of operating, Kelly summarizes the indications for the various modifications of the bisection method as follows:

"The median sagittal bisection of the uterus with the tumors is best applied to cases complicated by extensive inflammatory disease of both adnexa, where the inflamed structures cannot readily be reached behind

¹ American Journal of Obstetrics, 1900, vol. xiii., No. 3.

the tumors and where the tumor masses themselves are anchored to the pelvis by the adhesions. It is easier to enucleate a multinodular fibroid uterus in this way when the tumors occupy the lower part of the uterine body and are distributed in part subperitoneally. The effect of such an arrangement often is, when the masses are large, to lift up the ovarian vessels on the sides of the tumor and to cover them in so completely above the pelvic brim that they cannot be reached at the beginning of the operation.

FIG. 70.



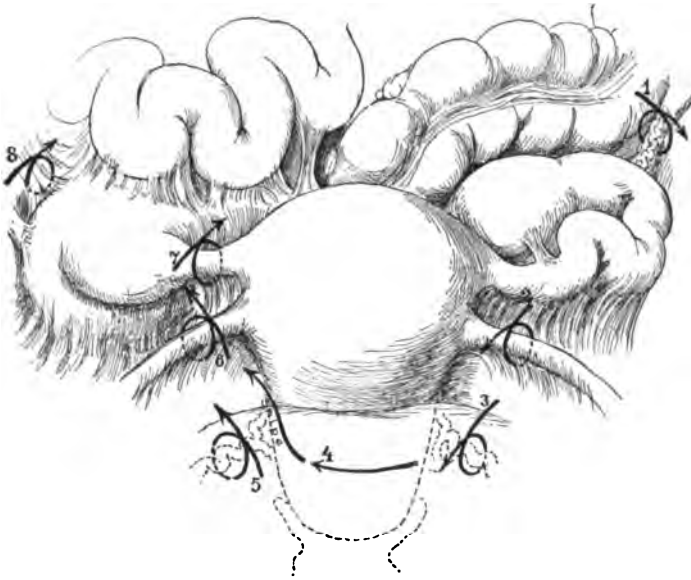
Method of removing the uterus, in a case of pelvic inflammatory disease, by a continuous transverse incision beginning on the left side. 1 controls the left ovarian vessels. 2 controls the left round ligament; the next step is to free the vesical peritoneum from the uterus and to push the bladder down; this exposes the left uterine vessels which are now controlled by 3. 4 represents the division of the cervix exposing the right uterine vessels controlled by 5. The division of the cervix is not directly across, a sliver or a snipe (4 to 6) is left in order to clamp the uterine vessels at a higher point. 6 is the ligature on the right round ligament, and 7 that on the right ovarian vessels. (KELLY.)—*Johns Hopkins Hospital Bulletin*, 1901.

“Enucleation by bisection of the tumor may be applied either in a myomectomy or in a hysteromyomectomy, and is a method best adopted where there is a single large subperitoneal tumor either in front under the vesical peritoneum or to one side in the broad ligament. When applied to a myomectomy (the removal of the tumor alone without the uterus) the mass is best bisected, because it rolls up and out on to the surface, as it is divided, with less injury and less handling of the extensive cellular investment than is necessarily the case where the mass is removed entire. During the bisection the tumor is rolled up through the in-

cision in its peritoneal covering, being evolved from the depths on to the surface step by step; while if the tumor is enucleated entire from its bed it is necessary to carry the fingers down around the tumor on all sides, effecting much of the separation in the dark and finally bringing up the large mass with much greater difficulty than the bisected portions.

"When the tumor is in front it may be necessary at most to clamp the vesical vessels when they are much enlarged; when the large tumor

FIG. 71.



Important modification of the method of enucleation described and shown in Fig. 70. When one side is densely adherent, it is best then to begin the enucleation with the opposite side in the order already described, and then after tying the round ligament at 6. The next step then is to clamp the cornu uteri and remove the uterus with the tube and ovary of the side on which the enucleation was started. The final step in the enucleation now is to remove the densely adherent side with forceps and scissors with all the advantages of abundant room and light afforded by the removal of the uterus. (KELLY.)—*Johns Hopkins Hospital Bulletin*, 1901.

lies in the broad ligament, then clamps should be applied to the vessels near the uterine cornu and at the pelvic brim, and to the round ligament in two places; then the tumor is bisected and unfolded, as it were, and removed, after which the divided broad ligament may be reunited. When bisection is applied to single, large, subperitoneal tumors as a preliminary to hysterectomy, it is done in order by their removal to collapse the vessels and the tissues which have been displaced and crowded against the pelvic walls. In the collapsed uterus the landmarks are easily found and the uterus is then readily removed.

"Enucleation by a coronal section of the uterus, still a different plan of operating, is that found necessary in the case of a fibroid tumor filling the pelvis and reaching as high as the umbilicus and adherent by its upper pole. In a case of this kind, described in a previous publication, the patient when put on the table had a rapid, small pulse which speedily ran up to 140."

On opening the abdomen it was found that the colon and the omentum were densely adherent to the coronal part of the large myoma. To have

FIG. 72.



The first step in the bisection of an adherent retroflexed uterus. The forceps catch the anterior face which is opened, then the bladder is pushed down and the cervix divided from side to side as indicated by the arrows. (KELLY.)—*Johns Hopkins Hospital Bulletin*, 1901.

attempted to dissect the colon from the tumor would have involved a serious injury to the bowel, with a probable resection. Then Kelly attempted to cut away the tumor as he had done in other cases, leaving part of it attached to the bowel, but this was immediately attended with alarming hemorrhage. He then turned to the lower pelvic pole of the tumor, hoping to be able to ligate the vessels from above downward and amputate the cervix. The tumor was attached to the whole anterior surface of the uterus above the cervix, pushing the fundus down to the pelvic floor, completely out of reach. Failing in all of the ordinary

methods to overcome his difficulties, the cervix, which was pushed up behind the symphysis pubis, was finally grasped from above and pulled forcibly up into reach through the abdominal incision. The bladder was then dissected loose and pushed down out of the way until the lower part of the cervix came into view. A knife was then plunged through the cervix in an antero-posterior direction between two pairs of museau forceps and the cervix was cautiously divided. The cellular tissue of the one side of the cervix was exposed and the uterine vessels

FIG. 73.



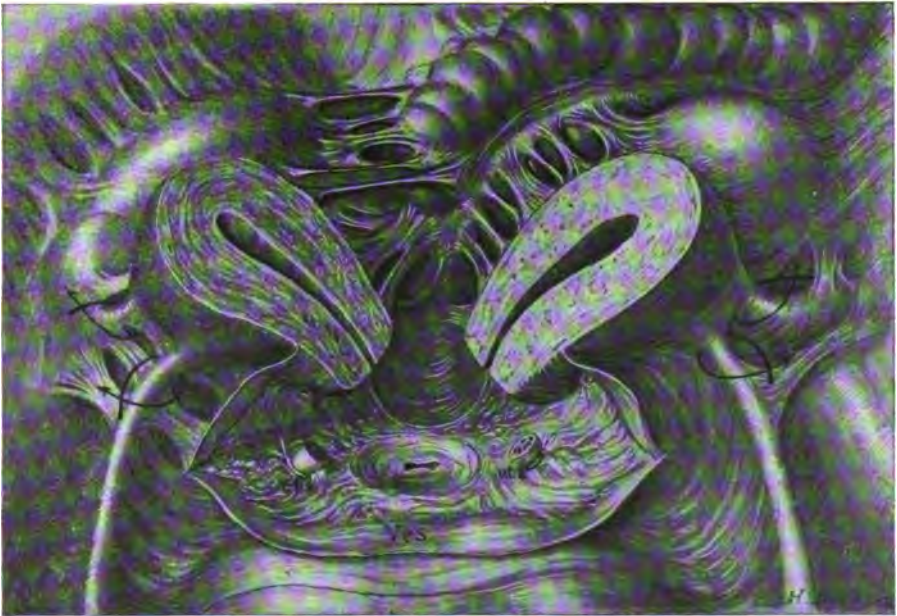
After freeing the cervix from its vaginal end it is held up and the bisection completed as shown here, in a direction from below up. (KELLY.)—*Johns Hopkins Hospital Bulletin*, 1901.

clamped with a very stout forceps; on the opposite side the uterine vessels were controlled in the same way. With the chief trunks thus secured, Kelly was able to forcibly drag the tumor up, rotating it, first exposing the round ligaments and then the ovarian vessels of the left and right sides respectively, thus permitting them to be securely ligated. With all of these chief vessels controlled the tumor was pulled upward and outward and only its dense adhesions to the colon remained. At this point a large abscess, situated between the colon and the centre of the tumor, ruptured, discharging a large quantity of fetid pus. The

tumor, however, was pulled up out of the wound and the colon dissected off from behind quite easily. The abdominal and abscess cavities were cleansed, the opening between the abscess and the bowel was closed, and a drain was put down into the abscess sac. "The patient made an excellent recovery, with a small, rapidly closing fistulous tract."

While the new operation suggested by Kelly appears to me to be an excellent one for certain isolated cases, I nevertheless feel that some little caution should be exercised in adopting too soon this unusual method of treating fibroids or inflammatory conditions. In the hands

FIG. 74.

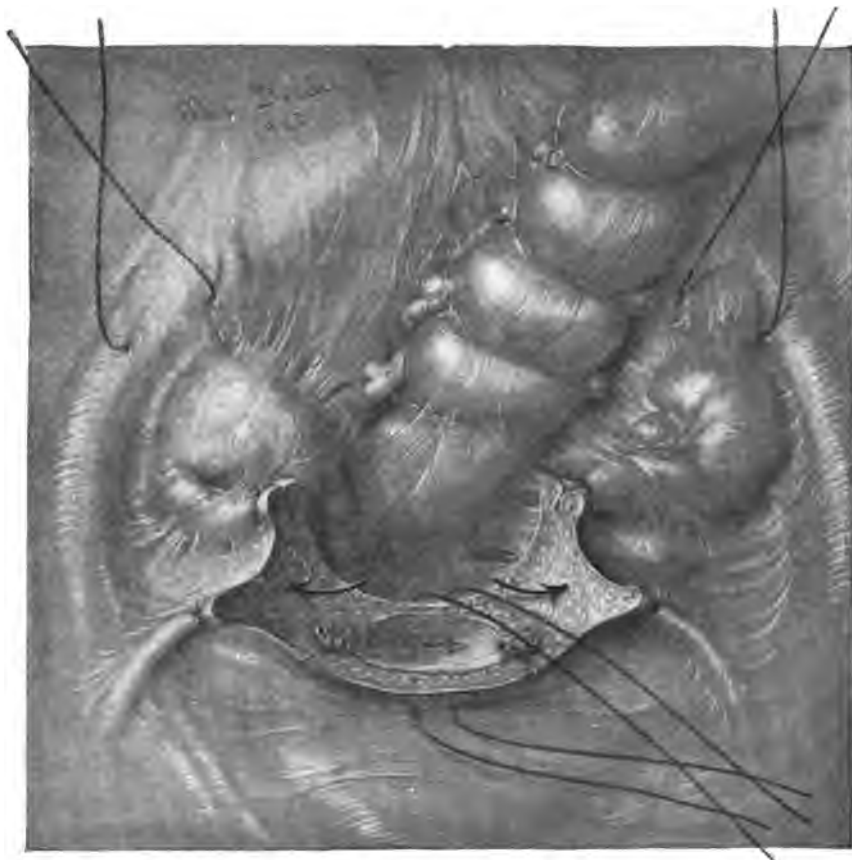


The bisection completed. Each half of the uterus is now removed by applying ligatures as indicated by the arrows on the round ligaments and the uterine cornua. The lateral inflammatory masses are removed last of all. (KELLY.)--*Johns Hopkins Hospital Bulletin*, 1901.

of a skilled surgeon this operation may have little difficulties, but in the class of cases in which Kelly deems it advisable there is always serious danger of profuse hemorrhage, and unless the surgeon is thoroughly experienced he may find, after bisecting the uterus, that he is unable to deliver it satisfactorily from the pelvis. In the meantime alarming hemorrhage is occurring from the bisected areas. In such a case to heedlessly tear the uterus out of its bed of adhesions would very likely result in serious lacerations of important structures, such as the ureter, bladder, or the rectum; therefore I look upon this operation as advisable only in the hands of a thoroughly experienced

man. To the novice who is just beginning his surgical work it would be infinitely better to even close an abdomen without attempting the operation than to attempt it and then, after he had bisected the uterus and it was profusely bleeding, to find that he was unable to satisfactorily deliver it from the pelvis, for under these circumstances a fatal termi-

FIG. 75.



Advantages of a bisection of the uterus enabling the surgeon to remove the uterus before removing either tube and ovary, thus affording all the conveniences of more room, abundant illumination and new avenues of approach indicated by the arrows. Ligatures may be placed on the ovarian vessels as shown before enucleating the uterine tubes and the ovaries, when the vessels are accessible. (KELLY.)—*Johns Hopkins Hospital Bulletin*. 1901.

nation would be inevitable. This is simply a precautionary word, for, without question, this is a distinct improvement in the technique of hysterectomy, and I shall unhesitatingly adopt it in the class of cases suggested by Kelly.

In a more recent article, Kelly¹ applies this same principle to the

¹ Bulletin of the Johns Hopkins Hospital, January, 1901.

removal of pelvic inflammatory masses by the abdomen after bisecting the uterus. Figs. 70 to 75, secured from the original plates in the *Johns Hopkins Hospital Bulletin*, explain graphically the method described by Kelly, which, as he states, is the same as that previously proposed by J. La Faure, of Paris. He claims for this method the following advantages :

1. Additional space for handling adherent adnexæ afforded by the removal of the uterus.
2. Great increase in facility of dealing with intestinal complications.
3. Better access by new avenues from below and in front to adherent lateral structures.
4. Elevation of structure to or above pelvic brim or even out into the abdomen, bringing them within easy reach of manipulation and dissection.
5. The same advantage in approaching both uterine vessels by cutting from cervix out toward the broad ligaments as is secured in approaching one of them in the continuous transverse incision method.

UTERO-ABDOMINAL FISTULA.

Fistulous tracts may form between the uterus and the abdominal wall after operations in which the uterine cavity has been invaded.

The operations which are most likely to be followed by this sequel are Cæsarean section, in which adhesions form between the uterus and abdominal wall ; after Porro's operation, in which the uterine stump is suspended in the abdominal wound ; after the enucleation of myomatous tumors, with partial excision of the uterus. In cases in which suppuration of the abdominal wound occurs a fistulous tract may burrow into the uterine cavity. That fistulous tracts, however, may arise from other causes than those above enumerated is proved by Warszowski,¹ for he has collected fourteen cases, all of which are more or less unique and interesting examples of this bizarre condition. He has classified them as follows : First, those occurring in nulliparous women, and, second, those in women who have borne children.

In unmarried women a fistulous tract may arise from the retention of menstrual blood due to the obstruction of the cervix or vagina through adhesions or from the presence of a new-growth. After sufficient time the accumulation of blood within the uterine cavity becomes very tense and seeks an outlet, either by rupture into the abdominal cavity or by the establishment of a fistulous tract into the bladder or rectum. In rare instances the clotted blood, after rupture, burrows downward, and,

¹ Monatschrift f. Gebürts. und Gynäk., vol. xiv. No. 6.

as in the case of Schröder,¹ points in the buttocks. In this way a fistula utero vesicalis, a fistula utero rectalis, a fistula utero parieto-abdominalis, and a fistula utero cutanea may be formed. In such instances as these the bleeding is menstrual in its type and occurs through the new tract. When the termination of these fistulous tracts is in doubt the periodic recurrence of hemorrhage naturally points very strongly to a communication with the uterus. Fistulous tracts between the uterus and the abdominal wall may occur as a result of perforation from carcinoma, sarcoma, or tuberculosis. A preliminary condition which favors the production of these fistulæ is a partial or complete obliteration of the cervical canal. A collection of pus within the uterus (pyometra) is not an infrequent sequel of cancer of the cervix, especially when it is of the scirrhus variety.

Fistulous communications between the uterus and the intestinal tract have been frequently noted in the literature; thus Neugebauer has found thirty-two such cases. Warszowski has further discovered that these fistulous tracts tend to point in the umbilical region.

These fistulous tracts in childbearing women may be due to the retention within the uterus of the fœtus or placenta. In the event of the death and suppuration of the fœtus within the uterus the fœtal bones may become embedded in the uterine wall and tend, as any other foreign body, to work toward the surface. Several cases are recorded in which the fœtal bones have been discharged on to the abdominal wall. These adventitious canals may also be due to the presence of foreign bodies within the uterus which have been inserted for the purpose of inducing a miscarriage; thus needles and wooden splinters have led to this remarkable condition. In two instances of this type menstrual bleeding occurred through the fistulous opening. Werder² has reported a unique case of a woman, aged twenty-nine years, who was sterile for a considerable time after marriage. An abdominal tumor was noted and an operation performed for its removal. The tumor was attached to the uterus by a broad, thick pedicle. After ligation of the uterine stump it was brought up into the abdominal wound and sutured. The patient made a moderately good recovery, but at the time of her discharge from the hospital there was still a small abdominal fistula leading into the uterine cavity. The menstrual bleeding occurred both in the natural way and through the fistulous tract. Later the patient became pregnant and went to complete term and bore a living child, after which the fistulous tract closed spontaneously and the patient made a final and perfect recovery.

Treatment. Little is necessary to be said concerning the treatment of these cases, for it is apparent that the only practical course is first to

¹ Lehrbuch der Gynäk., 1890.

² American Journal of Obstetrics, 1894.

remove the cause. If it be due to the retained products of conception the cervix should be dilated and the débris removed; if due to adhesions between the uterine and abdominal walls the excision of the fistulous tract and suture of the uterus is indicated. In case the fistula has arisen from a malignant growth it is extremely unwise to perform any operation, and only in rare cases of tuberculosis would operation be justifiable.

PROLAPSUS VAGINÆ.

Caruso¹ has described a new operation for prolapsus of the vagina. His method consists in the high amputation of the cervix, after which the vagina is sutured to the stump. Following this he performs a colporrhaphy and perineorrhaphy. This operator has employed his method only three or four times and reports good results in each case. The details of his operation are entirely too meagre to form an opinion as to its value, but I judge that it presents no very distinct changes from the older methods which have been heretofore employed. This method alone will not suffice in all cases. In some instances it is absolutely necessary, in order to effect a cure, to perform high amputation of the cervix, resect the relaxed tissue of both the posterior and anterior vaginal wall, and, in addition, suspend the uterus either by the Kelly or the Alexander-Adams operation. I am certain that a considerable proportion of cases if operated on exclusively by the method advised by Caruso, without suspension of the uterus, would end in failure.

INFLUENCE OF MENSTRUATION ON NEW-GROWTHS.

Paoletti² has reviewed the gynecological cases in the dispensary at Genoa to determine, if possible, whether there is any direct or indirect connection between menstruation and the growth of neoplasms of the uterus and its appendages. The total number of cases reviewed from this stand-point was 2851. As a result of his research he has arrived at the following conclusion: First, tumors of the uterus and its appendages arise largely from disturbances in the nutrition of the uterus; second, a close connection exists between menstruation and the new-growths of the uterus and its appendages; third, a very small proportion only of tumors arise in women who have menstruated regularly; fourth, in women who have menstruated early and in those in whom it is prolonged the greatest number of tumors have been discovered. The

¹ Arch d'Obstetricia e Ginecologia, 1899

² Rassegna d'Obstetricia e Ginecologia, 1899

percentage is much greater in the women who continue to menstruate late than in those in whom this function is prematurely abrogated.

In considering this subject the question naturally arises whether the menstrual disturbances are merely incident to or productive of the growth of tumors of the uterus and appendages. This Italian observer believes that the menstrual disturbances were actually the exciting agent to the atypical new-growths. As a matter of fact, I think he takes the wrong view, for in a very extensive review of histories of myomatous tumors I am constrained to accept the prevailing statement in the literature that changes in the catamenial flow are mere symptoms of tumor growth.

TREATMENT OF DYSMENORRHOEA.

J. S. Stone¹ summarizes his views upon the treatment of dysmenorrhœa as follows :

1. A large majority of cases of dysmenorrhœa occur in neurasthenic or neurotic women, and operative treatment alone will not effect a cure.

2. Dysmenorrhœa due to flexion is not cured by the use of the intra-uterine stem, for at best the uterus is kept straight only while the stem is in position.

3. The practice of divulsing the uteri of virgins under twenty-one years of age, or before maturity and complete development of the organ, is generally to be condemned.

4. Dysmenorrhœa due to actual obstruction or stenosis is rare, and if present we frequently find that one or more ineffectual operations have been performed.

5. Dudley's modification of Simm's operation appears to promise good results, as it insures a large cervical canal which cannot be closed by cicatricial contractions ; but this operation is indicated only in cases of stricture (stenosis) of the canal or else in those rare cases where an antelexion of high degree prevents the escape of the menstrual flow.

These conclusions of Stone are so pertinent as to require no comment further than to commend them to the thoughtful attention of scores of physicians and gynecological and general surgeons who consider dilatation or curettage all too lightly, and resort to either indiscriminately for all types of dysmenorrhœa. As a result I know of no operation which gives so little beneficial effects, but, on the contrary, may actually injure the patient, as this.

¹ "The Surgical and Mechanical Treatment of Dysmenorrhœa," *American Journal of Obstetrics*, February, 1900.

DISEASES OF THE BLOOD AND DUCTLESS GLANDS. THE HEMORRHAGIC DISEASES. METABOLIC DISEASES.

By ALFRED STENGEL, M.D.

THE BLOOD.

General Considerations. The study of the blood in general diseases, as well as in the so-called blood diseases, continues to be of special interest. There is, however, each year a growing disposition to regard the blood, as it should be regarded, as a fluid that records in its changed conditions the state of various organs or functions rather than primary diseases of its own constituents. The day of primary anæmias, or primary diseases of the blood in the old sense, has passed. At the present time we seek rather for the underlying causes, and look upon the disorders of the blood, as upon pathological states of the urine, as expressions of such fundamental and perhaps obscure conditions. As a natural consequence of this point of view, as well as of the failure of morphological methods to disclose new facts, the tendency is now set toward chemical studies, and with good prospect of productive results. As far as morphological studies are concerned, the year's contributions have added simplified methods, and little else.

Methods of Staining. New methods of preparing blood-films are recommended from time to time. These are designed to obviate the production of artefacts. In my own experience, the original Ehrlich method of allowing the blood to spread to a thin film is all-sufficient if the observer works neatly and with clean and thin cover-glasses.

E. J. Horder¹ recommends the preparation of blood-films by touching the drop of blood with a square piece of gutta-percha held in forceps and holding this over the cover-glass held with another pair of forceps. He claims that by this method artefacts are avoided.

Solly² suggests various methods that have been used to fix blood-films for Ehrlich's stain. A number of agents were tried by him without finding any satisfactory solution. A 2 per cent. solution of chromic

¹ Lancet, September 3, 1899.

² Presbyterian Hospital Reports, New York, 1900.

acid allowed to remain on the film of blood for thirty seconds gave a good result, the nuclei and granules of leucocytes being stained quite as sharply as when the specimens were fixed by heat, while the protoplasm of the leucocytes was even better fixed.

Laboratory workers have devised various methods of combined staining, some of which doubtless give pleasing results, but all of them are more liable to failure than the method of successive staining with two or more colors.

Willebrand¹ suggests the following method for combined staining of the leucocytes: Equal parts of 0.5 per cent. solution of eosin in 70 per cent. alcohol and a concentrated watery solution of methylene-blue are mixed, and the mixture then tested until it is found to give a diffuse blue stain. A 1 per cent. solution of acetic acid is now added drop by drop until, by using it on preparations, it is found to stain properly. The red corpuscles are stained red and the nuclei deep blue, the neutrophile granules violet, the oxyphile granules pure red, and the mast-cell granules deep blue.

Michälis² recommends a method of staining that is very generally applicable. The blood-films are fixed in alcohol for one-half hour to twenty-four hours, or with heat as on a copper plate. The stains are prepared from two stock solutions consisting of a 1 per cent. solution of chemically pure methylene-blue and a 1 per cent. solution of pure eosin. He insists upon the necessity of using freshly prepared distilled water. The stain is prepared by taking 20 c.c. of absolute alcohol, 20 c.c. of the methylene-blue solution, 20 c.c. of acetone, and 12 c.c. of the eosin solution. The first two are mixed and then the last two; prior to staining, 1 c.c. of each mixture is taken, and finally the staining solution prepared. The stain is allowed to act for from one-half to ten minutes. The first color should be a bluish, but this is afterward changed to a red, and at this point the staining should be stopped and the preparation mounted.

R. C. Rosenberger³ describes a blood-stain composed of:

Saturated aqueous solution of methylene-blue	50 c.c.
Saturated aqueous solution of phloxin	20 "
Alcohol (95 per cent.)	30 "
Distilled water	60 "

These are mixed, with the formation of a bluish solution. A precipitate may form, and the mixture then requires shaking before it is used. The blood-film fixed with heat or alcohol, or alcohol and ether, is stained for from one to four minutes, washed in water, and mounted.

¹ Deutsche med. Wochenschrift, January 24, 1901.

² Ibid., July 27, 1899.

³ Philadelphia Medical Journal, March 2, 1901.

The nucleus of the white cells is stained blue, varying in color according to the variety. The red cells are pinkish or reddish-green. The so-called neutrophiles are stained a dull pinkish color or bright red, showing that they are acidophilic and not always neutrophilic. The nuclei of lymphocytes are deeply stained, and around their periphery numerous basic granules are demonstrable, as a rule. The myelocytes are stained faintly blue, and the nucleus nearly fills the whole cell. The granules are seen stained also for malarial parasite.

H. Hewes¹ suggests for the staining of the blood the use of Ehrlich's tri-acid mixture for four minutes, then washing in water and staining quickly in Löffler's alkaline methylene-blue. This method has given very good results in my experience.

Ehrlich and his pupils, when originally occupied with the staining of red corpuscles, claimed that the living red corpuscle is refractive to all stains and that its assumption of color affinity is due to the fixation. They based this claim on their failure to find a stain which would cause a coloration of the corpuscles *intra vitam*. Recently some experiments have seemed to indicate a fallacy in this belief, as Marcus² has been able to stain the normal leucocytes in the fresh state by using neutral red. Diseased leucocytes were not stained.

Quite contrary to the general opinion regarding the specific value of morphological methods in different diseases, or still more in individuals, W. H. Birchmore³ believes that with careful staining methods the blood of different individuals may be differentiated, and that such examinations might determine whether one specimen was from the same person as another. This degree of confidence is certainly not justified by any facts of common knowledge.

The Leucocytes and Leucocytosis. The ultimate origin of the leucocytes is still a matter of discussion, and has not been brought any nearer a satisfactory solution by recent observations. Josue⁴ claims to have discovered by histological methods all varieties of leucocytes except the lymphocytes in the marrow. The series runs from the myelocytes through the mononuclear forms to the polymorphonuclear variety. Infections of the bone marrow lead to an augmented activity, the products of increased numbers of polymorphonuclear leucocytes. Leucocytosis, according to him, would be explained by a stimulation of the activity of the marrow.

Naegeli⁵ distinguishes three kinds of non-granular cells in the bone

¹ Boston Medical and Surgical Journal, July 13, 1899.

² Wiener klinische Wochenschrift, September 27, 1900.

³ New York Medical Journal, July 7, 1900.

⁴ Revue de Méd, December 10, 1900.

⁵ Deutsche med. Wochenschrift May 3, 1900.

marrow, the first resembling lymphocytes, the second being somewhat larger and with a pale nucleus, and the third being exactly like myelocytes, but having no granules. He regards them all as practically the same cell, and calls them myeloblasts because the myelocytes, according to his belief, are derived from them. There is a difference between these cells and lymphocytes, consisting in the constant oval form of the former and the tendency of the lymphocytes to be round. The myeloblasts contain no nucleoli, while lymphocytes do, and the protoplasm of the latter also is more basophilic. In pernicious anæmia the white cells of the marrow are almost exclusively myeloblasts, which is a further evidence of the embryonal character of these cells.

Among the practically useful results of studies of the blood the enumeration of the leucocytes takes a prominent position. The value of such studies to the surgeon is now quite generally appreciated, while the internalist has for a long time made the count of white cells an important part of his diagnostic measures. Increased knowledge has in certain directions limited the confidence of clinicians, but with a larger experience has come greater exactness of conclusions in a certain number of conditions. There are still many difficulties, such as the determination of the causes of pronounced leucocytosis in one set of cases and of moderate increase in another series of similar character.

CANCER. Auché and Vaillant¹ report four cases of carcinoma with reference to the leucocytes. In one of these, a case of rodent ulcer of the face of seven years' duration, leucocytosis was absent and the blood was normal in all respects. In the other cases there was leucocytosis, with predominance of the polymorphonuclear forms.

PNEUMONIA AND DIPHTHERIA. Heim² has studied the leucocytosis of pneumonia and diphtheria in childhood. In nineteen cases of croupous pneumonia there was regularly leucocytosis until a day or two before the crisis, when in most cases it suddenly subsided, while decline of the leucocytes was gradual in the cases in which lysis of the temperature occurred. Eosinophiles were absent until a day before the crisis. In diphtheria the leucocytosis was often extreme and sometimes appeared before the membrane developed, decreasing gradually after that unless complications were present.

Three cases of fatal pneumonia in which there was leucocytosis of 22,000 to 28,000, 16,000 and 10,000, respectively, have been reported by E. Becker.³ On the other hand, three severe cases which recovered gave counts of 31,000, 29,000 and 17,000, and a mild case 13,000.

¹ Journal de Méd. de Bordeaux, February 10, 1901.

² Archives de Méd. des Enfants, January, 1901.

³ Deutsche med. Wochenschrift, August 30, 1900.

He believes that a high grade of leucocytosis may designate severe infection, while moderate leucocytosis may be seen in very severe or mild cases. Moderate leucocytosis may mean only a moderate infection or a pure reaction, and the prognosis cannot, therefore, be made from the leucocyte count. In one of his cases in which recovery occurred 9 per cent. of myelocytes were observed.

PLEURISY. A study of the leucocyte counts of twenty cases of serous pleurisy has been made by J. L. Morse.¹ All of them were primary—that is to say, independent of any acute pulmonary disease. There were 224 counts, tabulated as follows :

3,000 to 4,000	2
4,000 to 5,000	19
5,000 to 6,000	40
6,000 to 7,000	31
7,000 to 8,000	50
8,000 to 9,000	42
9,000 to 10,000	27
10,000 to 11,000	8
11,000 to 12,000	4
13,000 to 14,000	1
	<hr/>
	224

Taking 10,000 as the normal, only thirteen counts were above normal, and nine of these were in one case, which at autopsy showed a secondary pneumococcus infection. The other four counts occurred in two cases, and in these the figures were very slightly above normal. These results correspond to those of Cabot, who found in ninety-nine cases an average of 6130, the leucocytosis having been met with in twenty-three of the ninety-nine. Two of Morse's cases proved to be tubercular at autopsy. No relation between the leucocyte count and the degree of fever or the character of temperature could be made out, nor could any relation be established between the amount of liquid and the number of white cells.

SYPHILIS. J. Monod² states that the first evidence of syphilis is found in the character of the blood. The blood is sometimes equally reduced in corpuscles and hæmoglobin, and sometimes the reduction affects the hæmoglobin principally. Leucocytosis appears early and is persistent. The occurrence of nucleated red corpuscles and a large increase of large mononuclear cells of the bone-marrow, and a decrease of other forms of leucocytes, are distinctive of the disease in infants. The effect of treatment is to cause a reduction in the leucocytes and an increase in the red corpuscles until the treatment has been prolonged for some time, when anæmia again develops.

¹ American Journal of the Medical Sciences, December, 1900.

² Thèse de Paris, 1899, 1900.

Justus' Test. D. H. Jones¹ tested 53 cases for the Justus syphilitic test, 18 of the cases being controls. Of the 35 syphilitic cases 17 were active cases not under treatment, and of these 13 gave a positive result; 1 active case under treatment gave a negative result. Of 8 cases with a primary lesion and granular enlargement 6 reacted negatively, while the 2 positive reacted cases had to be tested several times before giving the reaction. Of 7 cases of primary lesion, without glandular enlargement, only 1 reacted.

INFLUENZA. Examinations of the blood in influenza by O. P. Gerber² show that leucocytosis occurred when the fever declined, and less frequently during the persistence of the fever. The increase involved the polymorphonuclear cells; the eosinophiles and lymphocytes, as a rule, were decreased. Later, the eosinophiles and lymphocytes increased, while the polymorphonuclear cells decreased. There was never a high grade of leucocytosis, a count as high as 20,000 usually indicating a complication.

TYPHOID FEVER. E. Becker³ discusses the conditions of the blood in typhoid fever, and states that he has regularly found a reduced number of leucocytes, these disappearing at once on the establishment of convalescence. On the day following the disappearance of fever the leucocytes rose very rapidly to as much as 59 per cent. of the total number, and the eosinophiles reappeared. The eosinophiles, however, equally reappeared when complications occurred.

Eosinophilia. Bettmann⁴ describes the practical significance of eosinophile cells. The chemical examination of these cells has not given positive results regarding their nature. The most important chemical feature is the color reaction. The real nature of the eosinophile granules, like their chemical character, is also obscure. Regarding local eosinophilia, he refers to the enormous numbers of such cells found in the vesicles of pemphigus, but the same has also been found in other vesicles of the skin, and sometimes it fails in pemphigus. The investigation of the sputum for eosinophile cells has been a subject of much interest. Their discovery in bronchial asthma first excited attention, but later they have been found in a number of other diseases, and the author refers to the discovery of Teichmüller, who found them in the sputum of tuberculosis long before the tubercle bacilli appeared. They disappeared when the bacilli occurred. Bettmann found in ten patients with phthisis who were receiving injections of cinnamic acid that the eosinophile cells in the sputum increased in number. The same obser-

¹ New York Medical Journal, April 7, 1900.

² Wiener med. Wochenschrift, 1900, Nos. 25 and 27.

³ Deutsche med. Wochenschrift, September 6, 1900.

⁴ Volkmann's Samml. klin. Vortr., 1900, No. 266.

vation had previously been made by Landerer. The author refers to the increase in the number of eosinophile cells in the blood in various diseases as well as in conditions like starvation. On the other hand, in some conditions their number is decreased. He refers to the view of Ehrlich that the eosinophile cells are formed in the bone-marrow and that their appearance in the blood is the result of chemotaxis. The author further quotes certain observers, especially French authors, who believe that the eosinophile granules are excretory products, and he alludes to the fact that eosinophile cells have frequently been found in association with extravasations of blood.

The relation of Charcot-Leyden crystals to eosinophile cells has been investigated by Levy.¹ He found these crystals in all of the tissues in leucæmia, in the normal bone-marrow, in the sputum of various diseases of the respiratory tract, in nasal polyps, in various tumors, and in the intestinal discharges in cases of helminthiasis as well as in the blood. A certain relationship has, however, been noted between the presence of these crystals and an abundance of eosinophile cells. Levy found that when the eosinophile cells were present in the tissues in small numbers no Charcot-Leyden crystals could be observed, but when there were large numbers of eosinophile cells Charcot-Leyden crystals were always developed. The fact that the crystals are easily produced by contusion of tissues, or in some cases after decomposition, suggests that their formation is really a post-mortem one; but their occurrence in a very short time in the blood and in certain tissues might at first sight seem to oppose this view, though this is not really the case, as the rapid destruction of the leucocytes is well known. The author's view is distinctly that the crystals are the result of post-mortem formation.

TRICHINOSIS. W. W. Kerr² records two cases of eosinophilia in association with trichinosis. In these cases he observed severe muscular pain, digestive disturbances, pain and difficulty of protrusion of the tongue, rose spots on the abdomen, enlargement of the spleen and liver, excess of indican in the urine, and the presence of the diazo-reaction. Pieces of the muscle showed the trichinæ in both cases. In one case the eosinophiles ranged from 31.1 per cent. to 68.7 per cent. during five weeks, while in the second case they were from 18.1 per cent. to 86.6 per cent. Examination of the muscles showed no evidence of transition of the polynuclears to eosinophiles. The counts showed a leucocytosis of about 25,000 in each case. An excess of eosinophiles in the areas about the parasite seemed to indicate a chemotactic and phagocytic process. The author believes that the eosinophiles are

¹ Zeitschrift f. klin. Med., 1900, xl., 1 and 2.

² Philadelphia Medical Journal, August 25, 1900.

produced in the bone-marrow and that they are not converted into eosinophiles as a result of phagocytosis, but are original phagocytes especially attracted by this peculiar form of toxin.

LYMPHATIC ENLARGEMENT. Widall and Laisue¹ observed a case of general enlargement of the glands of the neck, axilla, and mediastinum in which the masses contained large numbers of eosinophiles. There was eosinophilia to the extent of 26 per cent., which diminished before death so that the eosinophiles finally disappeared completely from the blood. Achard, in discussing the paper, stated that eosinophilia is common in persons having general glandular enlargement, and he referred to a case of lymphosarcoma with marked eosinophilia of the glands, but without similar involvement of the blood.

Feldbausch² has found no regular rule for the occurrence of eosinophile cells in tumors excepting that he found them regularly in carcinomata of the skin, while their presence was variable in glandular cancers. He regards their presence as significant of beginning inflammation with the attempt at production.

The Leucocytic Granulations. Most authorities seem inclined to regard the granules of the leucocytes as important morphological elements of the cell rather than as mere products. J. Arnold³ regards them as excretion products or preformed structures constituting a living part of the cytoplasm. The granules were found by him in experimental work in living cells, and were evidently not merely particles taken up by phagocytic action nor the result of precipitation in staining. Using different dyes he found that some granules stained, while others did not; and some were larger than others, which leads him to believe that the granules are parts of the cytoplasm, some of which have undergone change, while others have not. Arnold's work was performed on rabbits and frogs. He suggests that the granular bodies of the cells should be called plasmasomes, and that only granular products of metabolism should be termed granules, the latter possibly resulting from the former.

Dust Granules. After studying the dust granules of the blood, E. G. Horder⁴ decides that they are merely extruded granules of the leucocytes, and suggests that they should be called the blood granules. This subject has been discussed in previous volumes of *PROGRESSIVE MEDICINE*, and the general opinion of investigators would seem to negative Horder's view, which, it may be added, has been advanced by others.

Basophile Granules in the Erythrocytes. For a long time certain granular bodies in the red corpuscles have been observed and their

¹ Gaz. des Hôp., July 7, 1899.

³ Virchow's Archiv, Band clvii., p. 124.

² Virchow's Archiv, 1900, vol. clxi.

⁴ Lancet, October 14, 1899.

nature discussed, but the frequency of these bodies was little appreciated until recently.

Ehrlich, in one of his papers, spoke of granules in the red corpuscles as signs of degeneration. Subsequently Lazarus, Askanazy, and some others expressed the views that these granules are remnants of a nucleus that had become dissolved, because they found the granular bodies in association with nucleated red cells. In a second paper, however, Ehrlich showed that the granules were found in some cases in which no nucleated cells occurred in the blood, and that, on the other hand, they were absent in cases in which such nucleated cells were found. Further, Bloch¹ observed that the granules were not stained with methyl-green as are the nuclei, and Ehrlich found that the granules were not present in the bone-marrow when nucleated red corpuscles were abundant. Litten² insists that karyolysis and basic granulation are distinct processes.

Recently, Sabrazes, Bourret, and Leger³ claim that they have discovered in the red corpuscles of embryonal blood all stages of dissolution of nuclei from the typical basic granulations to the normal nucleated corpuscle. I have myself seen distinct granules by the side of nuclei, but the nucleus in these cases was clear cut, evidently entirely normal. I have never seen a nucleus which showed any fraying or other evidence of degeneration in association with granules.

The recent attention to the granules in question has been largely stimulated by the papers of Grawitz, who has used the term basic degeneration and granular degeneration. In his first paper⁴ he reported basophilic granules in the interior of many red cells in tertian malarial fever. These were easily stained with methylene-blue. He also found these granules in cases of cancer, leucæmia, pernicious anæmia, and sepsis. They were absent in a number of other conditions. He does not regard them as evidence of polychromatophilic degeneration, since they always take one stain. They are evidently, however, degenerative conditions. In a subsequent paper⁵ he states that he considers the basophilic granules as positive evidence of degeneration, and does not believe them the result of karyolysis of nuclei. He adds to the diseases in which they occur, lead-poisoning, in which he found them in considerable numbers. They were absent in chlorosis, tuberculosis, and syphilis, as well as in Bright's disease. When present in large numbers they indicate a severe anæmia. Referring to the similar bodies discovered by Plehn in Africa, he believes that these

¹ Deutsche med. Wochenschrift, 1899.

² Ibid.

³ Journal de Phys. et de Path. Gen., November, 1900.

⁴ Deutsche med. Wochenschrift, September 7, 1899.

⁵ Berliner klin. Wochenschrift, February 26, 1900.

are the result of intense heat, since he could himself produce them in mice by subjecting these animals to high temperature. The granules in question are minute bodies, varying in size from the merest points (under powers of the microscope obtained with an immersion lens) to coarse bodies about the size of a small micrococcus. They are, as a rule, evenly distributed through the corpuscle or in a portion of it, but may be clustered. They are stained rather deeply with hæmatoxylin or methylene-blue in the ordinary method of preparation. The tri-acid stain of Ehrlich does not bring out the granules, as has been observed by a number of investigators.

With regard to the conditions in which these granules are found, Ehrlich has seen them especially frequent in pernicious anæmia.

Behrendt¹ and Hamel showed that they occurred very frequently and in large numbers in lead-poisoning. Ehrlich discovered that these granules occurred in cases in which, though there was great pallor of the skin, there was no appreciable morphological condition of the blood and no quantitative change from the normal number of red cells. His early view had been that the pallor was due to peripheral contraction of the vessels from the action of the lead. At present he is inclined to regard it as due to a change in the blood, though this does not appear in the way of reduced number of corpuscles.

Hamel found in twenty-four affected workers in lead that the granules were absent in but four, and these four had had nothing to do with the lead for months prior to the examination. In the other twenty astonishing numbers of granules were found, and this was in direct proportion to the severity of the illness. The granules decreased in number as the condition improved.

In a third paper, Grawitz² notes the occurrence of the condition in chronic lead-poisoning, in malaria, in cases of high fever, in pernicious anæmia, carcinoma, and in septic diseases. The occurrence of the condition in chronic lead-poisoning has been pointed out before. The author states that he regularly found granular cells in more than thirty cases of saturnism, and in each case in direct proportion to the gravity of the disease. He says: "In no illness, so far as I can judge, do these granule cells play so great a diagnostic and prognostic rôle as in lead-poisoning." It is interesting to recall that the examinations of the blood in patients suffering with lead-poisoning, notwithstanding their pallor and apparent anæmia, have generally shown no abnormality. In view of his recent discoveries Grawitz believes that the anæmia is real as well as apparent, since there is a direct deleterious influence

¹ Deutsche med. Wochenschrift, 1899, No. 44.

² American Journal of the Medical Sciences, September, 1900.

exerted upon the red corpuscle. In malarial cases the degeneration occurs frequently, as Plehn found in the Kamerun. Grawitz believes that the appearance of similar granular bodies in cases of high fever is to be taken as significant in the same direction as the occurrence in malaria. He mentioned that he was able to develop the bodies in white mice kept at a high temperature in boxes. In some of the animals kept at a temperature of about 43° C. for eight days there were large numbers of granular erythrocytes, and these had not previously existed. The occurrence of the cells in pernicious anæmia in association with other forms of degeneration and in leucæmia, Hodgkin's disease in its later stages, or in the severe cachectic conditions like carcinoma, is less remarkable. It is to be observed that the granules were absent in the blood of chlorosis as long as this was uncomplicated by severe intestinal disturbances. The author takes the latter fact as an indication of the independence of this disease and disease of the blood itself or of the bone-marrow, and as an indication of the neurotic basis for this condition. In septic conditions he found the granulation very frequent.

Schur and Loewy¹ have not found granules except in one single exception in the bone-marrow, while they claim that they are an almost constant phenomenon in the blood, as they have found them in anæmia in varying numbers, and state that if one searches long enough one can find them in almost every blood, even sometimes in perfectly healthy people in large numbers. They agree in this point with Litten,² and state that some smears show greater abundance of granules in some parts than in others, and very remarkably when two corpuscles lie one on another very commonly the granules are in the lower one. This cannot be due to chance, because, there being so few granular cells, this occurrence appears so often.

The nature of these granules has been studied experimentally, and the injection or administration of lead or other poisons has been found to produce abundant basic granulations in the corpuscles.

G. Moritz³ was able to produce basophilic granules in the red blood-corpuscles by administration of acetate of lead to rabbits. He found in six workers in a lead factory that all showed typical granules, while only one of these had the slightest symptom of plumbism. Another one had had symptoms previously. The author looks upon the granulations as of great diagnostic value, though he has found them in leucæmia, malaria, sepsis, and carcinoma. Sabrazes, Bourret, and Leger also investigated the subject experimentally, and found that injections

¹ *Zeitschrift f. klin. Med.*, 1900, p. 421.

² *Deutsche med. Wochenschrift*, 1899.

³ *Ibid.*, January 31, 1901.

into the peritoneal cavity or subcutaneously caused rapid appearance of basic granules in the blood. These were found often as early as twelve to twenty-four hours after the preliminary injection.

Kohn¹ regards the basophilic granules of the red corpuscles as a result of hydræmia, and was able to cause their appearance in the blood of animals by venesection. A. Plehn,² in staining the pigmented bodies observed by him in the blood-corpuscles, uses Ehrlich's hæmatoxylin-eosin mixture for from eight to twelve hours.

Of interest in connection with this subject is the study of Schmanch,³ who refers to certain bodies found in the blood-corpuscles of cats, both in the fresh blood and after adding methyl-violet. They moved actively in salt solution, but the author does not consider them as parasites. He believes that they are possibly remnants of the nuclei. These parasitic bodies could be increased by the use of pyridin or extract of bothriocephalus.

Erythrocytosis. Cominotti⁴ discusses erythrocytosis or hyperglobulia, and records a case in a woman, aged thirty-three years, in which splenectomy was performed. The spleen weighed $4\frac{1}{2}$ kilos. Before the operation the blood-counts had ranged from 7,000,000 to 7,500,000 red corpuscles and 6000 to 6500 white corpuscles, with 75 to 80 per cent. of hæmoglobin. The patient finally died of sepsis a month and a half after the operation, and showed two days before death 5,300,000 red corpuscles. In a second case of splenectomy which had been performed for malarial enlargement of the spleen there was a moderate increase in the number of red corpuscles several years after the operation. The differential count showed 40 per cent. of polymorphonuclears, 1 per cent. of large mononuclears, 47 per cent. of small mononuclears, 2 per cent. of transitionals, and 10 per cent. of eosinophiles.

The Coloring-matter of the Blood. The estimation of the hæmoglobin in the blood is perhaps the most useful clinical aid in the various forms of anæmia, but it must be conceded that this does not strictly indicate the amount of iron in the blood. Whether this be the case or not affects the clinical value of the method very little. It is, however, important that the divergence of results obtained by the two methods be recognized when the accuracy of one or the other method of estimating the "richness" of the blood is called in question on the strength of results obtained by the other plan. The independence of color-value and iron-content was well shown some years since by Biernacki, and

¹ Münch. med. Woch., February 6, 1900.

² Deutsche med. Wochenschrift, December 21, 1899.

³ Virchow's Archiv, Band cvi., S. 201.

⁴ Wiener klin. Wochenschrift, September 27, 1900.

recently Rosen and Jellinek,¹ in investigating the relation of the iron to the coloring-matter of the blood in diseases of the heart, found that there was a high color with decrease of iron. The same was true of jaundice, diabetes, and exophthalmic goitre. The color was lessened in chlorosis and other forms of anæmia, while the iron was relatively high.

METHODS OF ESTIMATING THE HÆMOGLOBIN. Linnell² refers to the unreliability of the color tests and the more satisfactory method of determining the specific gravity. In studying the specific gravity during sixteen hours in a healthy subject at different periods he found slight variation, the maximum range of the figures being from 1058 to 1063. It cannot be denied that the color methods are subject to grave errors, but all ready clinical methods of determining specific gravity are open to the same criticism. The improved forms of the Fleischl hæmometer and the newer instrument of Oliver give results sufficiently accurate for clinical purposes. What is especially needed at this day is a cheap instrument as reliable as these. The cost of both of these is too great.

A new instrument for determining the hæmoglobin of the blood which may fill this want has been constructed by Arthur Dare.³ Among the advantages are the determination of the color-index without dilution of the blood, and the possibility of making a sharp distinction between the shades of color. The pipettes used in the instrument all contain the same quantity of liquid, and can therefore be used with any instrument. The construction of the instrument is simple, and includes a chamber into which the blood is allowed to flow by capillary attraction and where it can be compared with a colored prism of glass. The greatest advantage in this instrument, to our mind, is the possibility of estimating the color without dilution.

Alkalinity. Waldvogel⁴ has modified Salkowski's method for estimating the alkalinity of the blood. He recommends the use of normal sulphuric acid instead of the quarter normal. He also suggests that the bulk of the solution should be determined exactly when the unneutralized sulphuric acid is titrated, as a loss of water may make a distinct error when one is working with small quantities. All determinations should be made with aliquot portions. Despite its disadvantages, the method seems an advisable one on account of its simplicity.

Fat in the Blood. M. Boenniger⁵ believes the best method is that of Hoppe-Seyler, performed as follows: 5 to 30 grammes of blood are

¹ Zeitschrift f. klin. Med., Band xxxix., p. 109.

² Journal of the American Medical Association, July 1, 1899.

³ Philadelphia Medical Journal, September 22, 1900.

⁴ Deutsche med. Wochenschrift, October 25, 1900.

⁵ Zeitschrift f. klin. Med., Band xlii., Hefte 1 und 2.

mixed in twenty times the bulk of 86 per cent. alcohol and allowed to stand for a day or two. The mixture is then filtered, the deposit again treated in the same way and afterward with ether. The ethereal extracts so obtained are evaporated to dryness, again extracted with ether, dried, and weighed. The amount of fat in the normal blood varied from 0.75 to 0.85 per cent. It was found high in diabetes, nephritis, and hysteria, and highest in a case of carcinoma of the œsophagus (1.4 per cent.). It was also very high in a case of pneumonia.

Isotonicity. Drazo¹ found that solutions of iodine are most reliable for determining the isotonicity of the blood. He uses stock solutions which are diluted with distilled water. The solutions employed are one containing 18.75 cgm. of iodine and 17.5 cgm. of potassium iodide dissolved in 100 c.c. of distilled water, and a second solution containing 1 cgm. of iodine and 2 cgm. of potassium iodide in 40 c.c. of distilled water.

Agglutination of Corpuscles. The increased viscosity of the erythrocytes under the action of heterogenous serum has been noted by myself (see *PROGRESSIVE MEDICINE*, 1900). Investigations have recently been made to determine specific actions of this sort in different diseases and in various animals. Malakoff² states that the blood of guinea-pigs and doves has no effect upon the corpuscles of goats, but if guinea-pigs are first injected with the goats' blood their serum shows marked action on the red corpuscles of the goat, and he looks upon this as a specific action, as it does not occur with the blood of man or the blood of other animals. He states that there is a specific substance which unites with the red corpuscles. When he added blood-serum of a goat to the blood of doves, rabbits, or man, and centrifugated the mixture, the serum acted only upon the blood that had been previously added to it and not upon that with which it had already reacted. If all three bloods were added it would not afterward react to any of them.

Friedberger³ found that the urine of guinea-pigs whose blood-serum caused the red corpuscles of the pigeon to agglutinate and dissolve possesses the same power. When a rabbit had been immunized against pigeon blood the urine showed the same property, but to a less extent. The author's experiments are still in a preliminary stage. These experiments may seem to be fanciful and to offer little prospect of useful conclusions; such off-hand consideration of the matter is not, however, entirely warranted. Careful work may determine really useful diagnostic methods and may throw light on the nature of certain anæmic diseases.

¹ *Riforma Med.*, 1899, Nos. 173, 174, 175.

² *Deutsche med. Wochenschrift*, April 5, 1900.

³ *Berliner klin. Wochenschrift*, December 31, 1900.

Bactericidal Power of the Blood. A. E. Wright¹ has attempted to elaborate a clinical method for determining the bactericidal power of the blood. Measured quantities of blood-serum are mixed in capillary tubes with micro-organisms in gelatin culture and placed in an incubator for one or two days. Control-tubes are filled with indifferent fluid, and at the end of the time the number of colonies are counted. The blood may be obtained from the finger, allowed to clot, then centrifugated. A considerable dilution is usually necessary in the test.

Electric Resistance. Oker-Blom² has found that the electrical conductivity of the blood is not directly proportionate to the quantity of serum. He found that the conduction through the blood diluted with its own serum was always a little less than the calculation would indicate. He investigated the subject further and found that electrical conductivity is reduced in a mechanical way by suspension of non-conducting bodies. He assumes that the electrical current is diverted in a zigzag way through the presence of non-conducting bodies. The blood-corpuscles play the part of such bodies in the blood.

Coagulation. Hubbard³ found that the coagulating effects of serum are independent of the antitoxic properties, and he finds that antidiphtheritic serum has active coagulating powers.

In experimenting with peptones, W. H. Thompson, Jr.,⁴ found that the amphopeptones delay coagulation, while it is increased by the anti-peptones. The action of the proto-albumoses is variable. There was generally a dilatation of the bloodvessels from paralysis of the peripheral branches of the splanchnics from injection of these substances except anti-peptone.

Phisalix⁵ found that the serum from reptilian blood when carefully collected from the sedimented blood coagulated spontaneously, while that containing a few blood-corpuscles remained fluid. He concludes that the corpuscles contain some substance or substances which prevent coagulation.

Medicinal Treatment of Anæmia. The use of drugs in anæmia still rests upon an empirical basis, though the contributions of recent years have perhaps established a somewhat more satisfactory understanding of the probable action of the medicaments that have been found of value. The older notion that iron and similar remedies act by their direct incorporation in the corpuscles has been practically abandoned, and the view of most authorities inclines toward the assumption of a

¹ Lancet, December 1, 1900.

² Archiv f. de Ges. Physiol, 1900, vol. lxxix., 9 and 10.

³ Lancet, October 4, 1899.

⁴ Journal of Physiology, vol. xxiv., No. 5, vol. xxv., No. 1.

⁵ Compt.-rend. de la Soc. de Biol., November 11, 1899.

stimulating effect of the drug upon the hæmopoietic organs. The large percentage of iron in the red corpuscle naturally suggests that, whether there is a direct or an indirect incorporation, the iron administered eventually finds its way into the substance of the corpuscle. The supposed discovery that the organic compounds alone supply the iron of the blood, while the inorganic salts, if active at all, operate in some indirect way, as, for example, by neutralizing toxic substances in the intestinal tract, lacks sufficient proof. Animals fed with iron-free food, but supplied with inorganic iron, have been found to thrive and to maintain the integrity of their blood. On the other hand, those in which iron, in whatever form, was withheld grow anæmic, as might be expected. Thus in the recent studies of Müller,¹ young pups which were fed with food containing no iron ultimately grew anæmic. The anæmia was increased by repeated blood-letting until the hæmoglobin and the number of corpuscles became very low. Subsequently the administration of inorganic iron in doses of 4 to 10 mg. per kilo of body-weight caused a decided increase in the hæmoglobin. He believes that iron is absorbed in the bloodvessels and not in the lymph-channels, as has been previously stated, and therefore he holds that caustic preparations are not well absorbed. Bland's pill and the oxytartrate of iron seem to him to be useful forms of administration. With other investigators, he holds that iron exercises a stimulating effect upon the bone-marrow because, after the use of iron, he found that the marrow contained a much larger number of red corpuscles and that the number of mitoses was decidedly augmented. In chlorosis the effect of the iron is the same as in ordinary secondary anæmia.

That the drug operates after its absorption from the intestinal tract and not by its local action is apparent from his experiments as well as from the well-recognized efficacy of iron administered hypodermically. Da Costa a few years ago called attention to the usefulness of certain preparations when incorporated in this way, and a number of recent writers have reached similar conclusions. Even intravenous injections have been practised, but these, as Grocco² has found, are dangerous and not any more useful than the hypodermic injection, which is well borne and especially valuable when the stomach does not accept the medication.

In the same connection may be cited the investigation of Steffanelli,³ who has tested the value of hypodermic injections of iron, manganese, and arsenic. He believes that the former two stimulate hæmoglobin formation, though to a less extent the manufacture of red cells. Arsenic acts only in the way of increasing the red cells.

¹ Deutsche med. Wochenschrift, December 20, 1900.

² Settimana Med., February 3, 1900.

³ Ibid., 1899, Nos. 40, 41.

The supposed variation in action of iron and other metals just referred to has been discussed by a number of writers, mainly Italian, and reference has been made to the subject in previous volumes of *PROGRESSIVE MEDICINE*. Results similar to those of Steffanelli were obtained by Aporti,¹ who found that the administration of hæmoglobin in anæmia caused an increase in the amount of hæmoglobin only, while arsenic increases the red cells without affecting the hæmoglobin. His experimental work led to a similar conclusion. He assumes from this and other evidence that the production of hæmoglobin and of the red corpuscles are independent processes.

Certainly the results of clinicians in the treatment of pernicious anæmia and chlorosis lend some color to the claims here put forth. The inadequacy of iron in the treatment of pernicious anæmia and the usefulness of arsenic (and this we assert despite the contrary opinion of Cabot, to which reference will be made in discussing pernicious anæmia), and the pronounced effect of iron in chlorosis are facts of importance in the question of the action of these substances. The use of manganese and, to a less extent, of other metals has found support in the profession, but with far less reason than the administration of iron and arsenic. The occurrence of manganese and copper in small quantities in the blood or tissues is not sufficient ground for the assumption that these metals are useful remedies in anæmia. A negative result was obtained by W. Wolf,² who undertook some experiments with copper sulphate and zinc to determine whether these metallic salts exercise a stimulating action upon the blood-forming function.

The results of administration of iron in different ways have already been referred to as throwing light on the certain action of the drug, but the reports have been somewhat conflicting, and in general it may be said that the experiments are too often open to question as to their scientific accuracy.

Contrary to the findings of Müller, Nathan³ has discovered in animal experiments that the iron of somatose, absorbed from the small intestine, was for the most part transported in the lymphatic stream. He regards it as doubtful whether or not it was absorbed by the bloodvessels. Most of the iron was excreted through the large intestine by the means of leucocytes, though the occurrence of iron pigment in the central canals suggested that some excretion of iron took place through the kidneys. The author, however, regards the absorption of the drug as important, and not its presence in the intestines. Like some previous observers, he regards the iron pigment of the large intestines as due to excretory

¹ *Centralbl. f. inn. Med.*, January 13, 1900.

² *Zeitschrift f. Phys. Chem.*, Band xxvi., p. 442.

³ *Deutsche med. Wochenschrift*, February 22, 1900.

efforts, but in a recent work Jollasse¹ found that citrate of iron in starch-water was well absorbed from the rectum and acted as does iron administered by the mouth. Some abdominal pain was caused, but otherwise no unfavorable symptoms.

CACODYLIC PREPARATIONS OF ARSENIC. The toxic and irritating effects of arsenic are a frequent hinderance to its use in anæmia. Recently a number of preparations of non-toxic character have been tried and have been highly lauded. Some discordant testimony has, however, been heard, as that of Gautier,² who found cacodylic preparations disturbing to the stomach and also occasionally irritating to the kidneys when these organs were not normal. Albuminuria sometimes resulted. He suggests avoidance of these results by the hypodermic use of cacodyl of soda in distilled water containing a small amount of phenic alcohol.

OXYGEN IN THE TREATMENT OF ANÆMIA. Reference has been made to this subject in previous years. It is easy to understand why oxygen was originally used in the treatment of anæmia, but the physiological experiments that have shown how little respiratory exchange of gases is affected by anæmia ought to have given a quietus to further attempts in this direction. It is, of course, conceivable that oxygen might act as a stimulant and thus indirectly affect the character of the blood; its direct efficacy is wholly supposititious. Clinical results like those of P. G. Lodge,³ who found marked improvement from inhalations of oxygen in the treatment of severe anæmia, prove but little. He found general increase of vigor, as well as increase in the number of red cells, as the result of the treatment. This seemingly substantiates the view we have expressed regarding the probable manner of action of oxygen.

PERNICIOUS ANÆMIA.

The interest in pernicious anæmia largely centres in the consideration of the nature of the disease and its diagnosis, and in both matters there is still difference of opinion. In a paper read before the New York State Medical Association,⁴ I expressed the view that pernicious anæmia, according to our present evidence, is undoubtedly a disease resulting from the rapid destruction of red blood-corpuscles, for the compensation of which the blood-making functions prove inadequate; and, further, that the source of the hæmolytic agents is the gastro-intestinal tract. These statements are perhaps quite generally admitted, but there is a difference of opinion as to the extent to which

¹ Münchener med. Wochenschrift, 1899, No. 37.

² Bull. de l'Acad. de Méd., October 21, 1899.

³ Lancet, April 7, 1900.

⁴ Medical News, October 20, 1900.

they may be applied. For example, it is held by Ehrlich and some of his pupils that there is a distinct form of activity in the bone-marrow in pernicious anæmia, to which he would apply the term megaloblastic, and that this does not occur in other forms of anæmia or cachexia. According to this view, the process in the bone-marrow is the essential feature of pernicious anæmia, and not the preliminary destruction of corpuscles, while according to another view pernicious anæmia may occur in any individual in whom active blood destruction is taking place beyond the capacity of the bone-marrow and other blood-making structures to repair the loss. It does undoubtedly seem to be true that certain individuals are normally endowed with too little blood-making power. It is impossible, however, in the present stage of our knowledge, to indicate any special causes of such weakened hæmogenetic function, and we must regard only as curious or interesting such reports as that of C. L. Dana.¹ In reporting a case of pernicious anæmia in a woman, aged forty-seven years, he calls attention to the fact that the patient was the thirteenth of fourteen children, all the others, with one exception, having been stillborn, and the one exception having finally died of pneumonia. There was no specific history, but the author looks upon this case as one in which there was extreme constitutional weakness, such as occurs in some other diseases like the muscular dystrophies, hereditary chorea, forms of dementia, locomotor ataxia, etc. From these theoretical considerations he concludes that pernicious anæmia is primarily a disease of hæmogenesis, and that the blood-cells are poorly constructed from the beginning. The theories of special infections or of intoxications of various sorts he does not regard as convincing. In the case reported by him the blood-count showed 958,000 red corpuscles, 23 per cent. of hæmoglobin, and the morphological characters of pernicious anæmia. The author believes that sufficient attention has not been given to the family history of cases of this disease. It might be pointed out that in the history of the disease no special tendency to implicate certain families has been discovered, nor has any direct hereditary tendency to it been found. The author looks at the matter entirely from the hæmogenetic side, whereas others have viewed the disease almost solely from the hæmolytic aspect. The truth of the matter is probably as was stated, viz., that the malady is one of hæmolysis with faulty hæmogenesis.

Referring again to the question of the specificity of the changes in the bone-marrow in pernicious anæmia, I would maintain that the proofs in favor of a special variety of disease of the marrow are insufficient, and, on the other hand, there are abundant cases recorded in the

¹ Medical Record, December 1, 1900

literature which prove the possibility of rapid and intense anæmia closely simulating if not identical with pernicious anæmia, due to certain specific diseases of the bone-marrow, like carcinoma or myeloma. As bearing upon this subject, the paper of Frese¹ is interesting. He reports a case of severe anæmia due to metastases of carcinoma to the bone-marrow. The patient, a man aged twenty-six years, had suffered with pain in the stomach and subsequently severe pains in the bones, with marked emaciation. On admission to the hospital he was profoundly anæmic. Toward the end of life leucocytosis developed. Carcinoma of the pylorus, with metastases to the lymph-glands, lungs, medulla, and the pons, was discovered. In a second case, a woman, aged twenty-eight years, gastric symptoms had existed for nine months and a gastro-intestinal fistula was made. Subsequently profound anæmia developed and metastases to the bones were discovered at the autopsy. In both cases the conditions of the blood resembled those of progressive pernicious anæmia. In the first case there was high fever.

Gastro-intestinal Origin of Pernicious Anæmia. If, as has been intimated, the gastro-intestinal tract is the source of hæmolytic agents that cause pernicious anæmia, it will prove interesting to determine the exact conditions that cause the formation of the poisons in question. Atrophic conditions of the mucosa of the stomach and intestines have been described, and occasionally other lesions. A recent report of A. E. Barker and W. Hunter² is highly interesting in this connection. They report an instance of pernicious anæmia which occurred in a man, aged twenty-eight years, who had been run over by a wagon some years previously, and who, after a prolonged illness, became extremely anæmic and suffered with attacks of vomiting and pain. His red corpuscles fell as low as 1,000,000 and the hæmoglobin to 20 per cent. Nucleated red corpuscles were not found, but the red corpuscles varied in shape and size. An operation was undertaken and a stricture of the small intestine was found, but the patient died. There was a great excess of iron in the liver and kidneys. Suppurative foci were found in the ethmoidal cells and at the roots of a number of the teeth. The diagnosis in this case is open to much doubt, and the bearing of the intestinal lesion to the anæmia is questionable.

Far more instructive are the instances of typical or atypical pernicious anæmia in association with intestinal parasitism or infection. The recent report of Pane³ contains an account of a case interesting in this connection. A patient suffering with extreme anæmia, with intestinal symptoms, died after an illness of five months. The examination of the blood

¹ Deutsche Archiv. f. klin. Med., September 27, 1900.

² Lancet, July 21, 1900.

³ Riforma Med., 1899, xv., 103.

showed 754,000 red blood-corpuscles, 22 per cent. of hæmoglobin, and 16,390 leucocytes. There was an absence of nucleated red corpuscles, and the differential count showed 75 per cent. mononuclear cells and 25 per cent. polynuclear elements. Of the mononuclear cells two-thirds were large forms, three times as large as normal cells, and frequently degenerated so that the nucleus could not be distinguished from the protoplasm. The granules of the polymorphonuclear cells were absent and eosinophile and basophile granules were also absent. The examination of the stools showed mucus and numerous long bacilli. There were no bacilli coli communis. The question of the pathogenicity of the organism found in the stools is difficult to answer, as no investigations proved its specific action. The nature of this case is very uncertain, but its resemblance to several instances of pernicious anæmia associated with peculiar bacterial infections of the gastro-intestinal tract (such as the case of Sandoz) is striking. There was evidently a profound disturbance of blood-making, as shown by the non-granular character of the polymorphonuclear cells and by the reduction in the number of these cells. The leucocytosis is of doubtful significance.

The association of pernicious anæmia and animal parasitism is more definitely known. In some cases, as, for example, ankylostomiasis and bothriocephalus invasion, the parasite is undoubtedly directly responsible. In others the connection is not so clear. Thus there has been recorded a number of instances of pernicious anæmia associated with tæniæ and even ascarides. An instance in point is that reported by E. Becker,¹ in which two tænia saginatae were found in the intestines. There was a good deal of gastro-intestinal disturbance, which the author attributed to the parasite, and in turn he regarded the anæmia as probably secondary. This statement is made by him after fully recognizing that the frequent occurrence of this parasite without anæmia makes a causal relation between its presence and the occurrence of pernicious anæmia improbable. Two other cases are reported that have special interest in connection with the above case. In one the blood-count fell to 284,000 shortly before death. In the second, which is described as one of secondary anæmia, the count fell to 680,000 red corpuscles and the hæmoglobin to 18 per cent. This was an instance of tuberculosis of the intestines and mesentery glands, with ulcer of the stomach. The author suggests that the pressure of tubercular masses upon the large lymph-vessels hindered the movements of the chyle and so produced anæmia. In an instance of post-hemorrhagic anæmia he found the red cells reduced to 800,000. The white cells numbered 17,000. There were myelocytes, 32 nucleated red cells to 250 leucocytes, and some megalo-

¹ Deutsche med. Wochenschrift, September 6, 1900.

blasts. In referring to the white corpuscles the author speaks of the great leucocytosis, and it is possible that, through a typographical error, the number has been stated at 17,000 and should be 170,000.

The clinical features of anæmia of ankylostomiasis are well determined, and little doubt can be entertained regarding the identity of the anæmia and pernicious anæmia due to other causes. In a general discussion of the subject G. M. Giles¹ points out that ankylostomiasis is the cause of much sickness and many deaths. The ankylostoma is frequently found in healthy persons, but is always liable to produce anæmia and other diseases. The anæmia is the result of damage to the intestinal mucous membrane as well as to the direct loss of blood, and he further considers it likely that intoxication may be produced by the worm. C. F. Fearnside found the ova of ankylostoma in the discharges of 68.1 per cent. of 678 new arrivals at the prison of Rajahmundri. Of 72 persons who had the parasite 13.9 per cent. were in bad health; 16.1 per cent. had some symptoms, while 70 per cent. were in good health. The ascaris lumbricoides was present with the ankylostoma in 35 per cent. of the cases. The examination from the discharges of 200 convicts who had been in jail for six months, and therefore under better conditions as to food, etc., showed ankylostoma to be present in but 58 per cent. of the cases and the ascaris in only 18.5 per cent. In 105 post-mortem examinations the ankylostoma was found in 74.3 per cent. In 57.9 per cent. of these there was local congestion of the bowel, and in 11.4 per cent. erosions or ulcers. The author believes that the effect of ankylostomiasis is largely secondary, the symptoms being caused by coincidental diseases such as malaria and dysentery. He does not believe that ankylostomiasis is present unless some other cause of anæmia or all other distinct forms of anæmia are excluded. L. Rogers defined the term ankylostomiasis as an infection characterized by anæmia, the result simply of loss of blood. When but few ova are found in the stools it can be said that there are few parasites—perhaps fifteen or less; when the parasites are numerous practically every microscopic field will show ova. In studying the blood of certain natives of Assam he found the hæmoglobin, on the average, about 60 per cent., or a little more than this. The red corpuscles numbered about 4,700,000, and the leucocytes were practically normal in number. He points out that in epidemic malaria the hæmoglobin is reduced to 30 per cent., the red corpuscles to about 2,500,000, and the leucocytes to about 2500. In chronic malaria there is still greater reduction of the red corpuscles. In ankylostomiasis the leucocytes were but slightly reduced, the red corpuscles frequently as low as 1,000,000 and the hæmoglobin about 10 per cent.

¹ British Medical Journal, September 1, 1900.

The great reduction of the hæmoglobin was characteristic of ankylostomiasis, the color index being about 0.31. The white corpuscles were relatively much less reduced. In malaria he always found the color index higher. O. Baker found in sixty-nine natives of Burmah 55 per cent. affected with ankylostoma. Several of the speakers recommend thymol as a most useful remedy.

It must be recognized as proved that ankylostomiasis does not invariably cause pernicious anæmia, but in the same way ingestion of the typhoid bacillus, and possibly even its growth and multiplication in the intestines, do not necessarily cause typhoid fever. There are elements of susceptibility and, as has been intimated before, of reduced hæmogenesis that need consideration.

Diagnosis. The recognition of the disease, while easy in typical cases, is sometimes very difficult and may be impossible. Those who insist upon the sufficiency of morphological studies of the blood-corpuscles will deny the contentions of Lipowski,¹ who states that while the occurrence of macroblasts is generally regarded as most significant they are not infrequently absent. The presence of microcytes and poikilocytes is, of course, in no sense significant, in view of recent knowledge. This author reports a case of peculiar character which occurred in a woman, aged thirty-one years. The patient entered the hospital suffering with profound anæmia and repeated hemorrhages from the mucous membranes after having ingested some unknown poison. The anæmia increased and the patient died. The absence of nucleolated red corpuscles and the occurrence of a proportion of 90 per cent. of lymphocytes is considered by the author as testimony in favor of an advanced lesion of the bone-marrow, and he reports the case to suggest that it might be considered in the category of pernicious anæmia. He also reports a case of pernicious anæmia in which it was shown that the general signs of that disease may be present and the blood-count may be significant before any morphological changes occur in the blood. The hæmoglobin fell to 10 per cent. and the red blood-corpuscles numbered 800,000 just before death, and there had been hemorrhages in the skin, changes in the eye-grounds, and irregular fever. The diagnosis of pernicious anæmia was made in this case, but he observed no changes in the morphology of the corpuscles at any time, while changes in the size of the corpuscles were not seen until very late. I have observed several cases, one at least being confirmed by autopsy, which fully substantiated this observation.

Of the diseases which simulate progressive pernicious anæmia, latent cancer of the stomach is by far the most important, and is one which at

¹ Deutsche med. Wochenschrift, May 24, 1900.

times cannot be positively differentiated. A. Abrams¹ recently reported two cases of pernicious anæmia in rather advanced stages, in which gastric symptoms suggesting carcinoma were observed. Both cases improved under the administration of arsenic. It is, of course, possible that pernicious anæmia may complicate gastric carcinoma or that the latter disease may arise on a basis of pernicious anæmia. As a rule, however, we have to deal with the simulation of pernicious anæmia by the cachectic state of cancer. Frederick P. Henry has repeatedly discussed the diagnosis in question, and has recently² referred to it again. He states that he has never seen a case of gastric cancer in which the red corpuscles were reduced below 30 per cent—that is to say, below 1,500,000 per c.cm.; and, on the other hand, he has never seen a case of pernicious anæmia in which the count did not, before death, fall below 1,000,000. He does not deny the possibility of reduction in gastric cancer below the figure named, but he would be inclined to believe in such a case that the cancer was complicated with pernicious anæmia or the reverse. I have no doubt that the statements made by Henry are in the main accurate and will coincide with the expression of others. I should be disposed, however, to place the minimum blood-count of ordinary cases of gastric carcinoma at 1,000,000, though I have only rarely seen this figure approached. On the other hand, cases of progressive pernicious anæmia are not frequently recognized as such in their preliminary attacks, with blood-counts above 1,500,000. Subsequently, during a remission, the morphological features of the blood persist, though the blood-count has risen to numbers considerably above that given. It seems, however, that in the primary attack the count falls to a very low figure before the morphological changes assert themselves. This is in accord with the statement of Lipowski, to which reference has already been made.

Clinical Features. The clinical features of pernicious anæmia are well known, and, with the exception of those dependent upon involvement of the nervous system, have received few additions in recent years. The most interesting series of cases has been reported by R. C. Cabot.³ He publishes his conclusions regarding pernicious anæmia, based upon a study of 110 cases. In 19 cases there was an autopsy as well as clinical observations. In 60 cases there were typical clinical signs, but no autopsy; 19 cases were typical in the clinical signs, but the patient was lost sight of; in the 12 remaining cases the clinical features were typical, but the patients are still living. Of the 110 cases 57 were males and 53 females; 28 cases occurred under forty years; the rest after that age. There was no typical case under nine years of

¹ Medical Record, April 28, 1900.

² American Journal of the Medical Sciences, August, 1900.

³ Ibid.

age. In 4 cases the disease began after parturition or during the previous pregnancy. Hemorrhage played a part in 37 cases, but never preceded the onset of the other symptoms; 2 of the cases were complicated with nephritis. In studying the symptomatology he remarks the uniformity and monotony of the symptoms and the relative freedom from symptoms in many of the cases. The ability to work with corpuscles below 2,000,000 is remarked. This has generally excited the comment of systematic writers. The preservation of the color of the skin in some cases is also of note. Muscular weakness, pallor, dyspnoea, and gastric symptoms were the symptoms in the order of frequency. Lack of appetite, disturbance of the bowels, and symptoms referable to the nervous system were common. In 15 of 36 cases the retina showed hemorrhage and in 21 cases it was normal. Enlargement of the liver was found in 30 cases and of the spleen in 13. About half of the cases showed evidence of emaciation. In the remainder the fat-layer was well preserved. The latter statement, however, does not accord with a statement made under the heading of Diagnosis, that "striking absence of emaciation in most cases is one of the distinctive features." Fever was common, occurring in about two-thirds of the cases. Nothing new is shown in the examination of the blood additional to what has been previously published by the same author or others. The number of red cells was below 2,000,000 in 106 cases and from 2,000,000 to 2,500,000 in 4 cases. The number of leucocytes was always below 13,000. The hæmoglobin was relatively high in 79 and not relatively high in 31 cases. The average diameter of the red cells at the last examination was increased in 29 and not increased in 21 cases. Megaloblasts at the final examination predominated in 37 cases, and were absent in 3 cases in which only one examination was made. The lymphocytes were below 30 per cent. in 34 cases and above 30 per cent. in the remaining 76 cases. The eosinophile cells were absent in 7 cases, under 4 per cent. in 90 cases, and over 4 per cent. in 13 cases. Myelocytes were found in 66 cases. The distinction between pernicious anæmia and secondary anæmia cannot be made clinically because there is no distinction in the marrow between normoblasts and megaloblasts. This statement of Askanazy has not been borne out by subsequent investigation. The author accepts Pappenheim's differentiation of the two types of blood formation, the foetal and the adult type, but he does not believe in the possibility of a secondary pernicious anæmia, though he accepts the possibility of rapidly fatal secondary anæmia. Still, he accepts parasitic anæmia as a secondary form of anæmia indistinguishable from pernicious anæmia. Three of the cases in this series lived from four to five years; seven from three to four years. Most of the cases received Fowler's solution, but he does not believe that this

remedy or any other has any effect upon the clinical course of the disease.

The last statement regarding the effect of arsenic in the treatment will not be accepted by most clinicians, and certainly does not accord in the least with my experience. Making every proper allowance for the tendency of the disease to improve spontaneously, I am convinced that I have repeatedly seen a wellnigh specific effect from the administration of arsenic. Frederick P. Henry¹ reports five cases of pernicious anæmia, in three of which there were autopsies. These cases were selected from a number observed during recent years because they exhibited points of special interest. In the first case paralysis of the extensor muscles of the hands and feet, evidently due to peripheral neuritis, occurred, and the question of its being toxic and induced by arsenic or not is discussed. Henry believes that if arsenic were the cause such peripheral neuritis would be of common occurrence. In the same case, however, there was bronzing of the skin, and, in addition, freckle-like spots scattered over the surface. These conditions would more strongly indicate arsenic, though the author gives no decided opinion. In the second case reported convulsions developed after transfusion of blood from an epileptic. These convulsions took place ten days after the transfusion and were not repeated. Had the convulsions occurred immediately after the transfusion the author would have regarded them as the result of circulatory disturbances. In a third case there was improvement, which occurred when orexin was administered. The same drug, however, failed in other cases. Cases IV. and V. show the tendency of the disease to be complicated with erysipelas.

The nervous symptoms of pernicious anæmia have been found more common than as at first believed. To some extent they may be due to the administration of arsenic, as in the case reported by Henry, in which it does not seem to us there could be much doubt of the arsenical character of the nervous disturbances. Of course, it must be recognized that pernicious anæmia in itself is capable of producing changes in the nervous system, and also that pigmentation of the skin may be a symptom in this as in other blood diseases. The symptoms, however, correspond so closely with those which I have seen as a direct result of large doses of arsenic, and attended by other and unequivocal signs of arsenical poisoning and fluctuating with the increase and decrease of the amount of arsenic administered, that there has seemed no doubt. At the present time I have two cases of pernicious anæmia under observation, with distinct arsenical pigmentation, corresponding in every respect

¹ American Journal of the Medical Sciences, August, 1900.

with the arsenical pigmentation in a third case, of bronchial asthma, which had been treated with prolonged and excessive courses of arsenic.

Other nervous conditions, however, are more difficult to determine. I refer here to the instances of central nervous disease in the course of pernicious anæmia. The effect of the metals, such as arsenic, copper, and lead, upon the central nervous system has not yet been thoroughly determined, but it is highly probable that they occasionally produce destructive lesions. An instance of spinal disease in association with pernicious anæmia is that reported by Sir Dyce Duckworth,¹ in which a man aged thirty-six years, having pernicious anæmia, developed marked nervous symptoms. There was a feeling of swelling and numbness in the leg, without wasting. Almost complete anæsthesia developed in the legs below the knees and in the small sciatic area. The knee-jerks were exaggerated on both sides, but there was no ankle clonus. Difficulty in micturition and loss of control of the sphincters developed. The autopsy showed well-marked signs of pernicious anæmia and softening of the lumbar portion of the cord, to which the spinal symptoms were ascribed. Gallstones were also found. The character of the lesion in this case was not such as has been usually found as the result of pernicious anæmia nor the kind that is likely to be produced by arsenic. There may be, and probably was in this instance, a purely accidental association.

Treatment. The subject of treatment of the disease has been referred to incidentally in speaking of the symptoms and clinical course. It may be worth while, however, to refer to some special procedures that have been reported recently. It may be recalled that Hunter a year or more since suggested that infections from carious teeth play an important rôle in the etiology of the disease. Acting on this suggestion, Elder² has treated a case of pernicious anæmia by using antiseptic mouth washes and giving antistreptococcic serum. Remarkable improvement is reported, but the case was certainly not one of pernicious anæmia, though there are some symptoms highly suggestive of the diagnosis, and the condition of the blood was rather indicative of this. The teeth were in very bad condition, and the author was led to use the treatment in accordance with the recently expressed view of Hunter regarding the etiology of the disease. In a clinical way the same theory is referred to by L. M. Van Meter,³ who records a case of pernicious anæmia of rapid development, the first symptoms having appeared two months before admission to the hospital. The author refers to the bad condition of the teeth. The blood-cells became reduced to 390,000 and the hæmoglobin to 14 per cent. An increase of the leucocytes was dis-

¹ British Medical Journal, September 10, 1900.

² Lancet, April 28, 1900.

³ Philadelphia Medical Journal, October 27, 1900.

covered, and the myelocytes at one time reached 4 per cent. Notwithstanding the great reduction in the red corpuscles the patient improved, and at the last count there were 896,000 red corpuscles. A great deal more definite proof is wanted before the theory of Hunter can be accepted.

The rapid improvement in some cases of pernicious anæmia under the influence of treatment and spontaneously has been alluded to. At times this leads to unwarranted conclusions regarding treatment, and it is always necessary to bear in mind the possibility of the recurrence in discussing the value of any form of medication.

A. C. Coles¹ reports two cases of pernicious anæmia which are striking on account of the rapid increase in the number of the red corpuscles. In one case these increased from 1,642,500 to 4,075,000 in a month; in the other case from 666,666 to about 4,500,000 in two months. The hæmoglobin increased from 14 per cent. to 50 per cent. Ultimately both cases succumbed.

CHLOROSIS.

The nature of chlorosis still remains a subject of interest and of discussion. The gastro-intestinal origin of the disease which has been postulated has not been proved. Some of the older theories have certainly been disproved. The relation of the disease to displacement of the stomach is evidently a close one, though it may be questioned whether the gastric conditions are the cause of the chlorosis. The sequence may be rather in the other direction. Recently, Rostowski² has studied the position of the stomach in a number of cases to determine the frequency of this association, and found that about 26 per cent. of the patients with chlorosis present the position of the stomach referred to. While this percentage is higher than the percentage of otherwise normal women who would show gastropptosis, it is not sufficiently high to indicate that the gastric affection stands in any causal relation to the condition of the blood. It may, of course, be one of the factors which contribute toward disturbing the general health and thus aiding in the development of the disease.

A number of interesting cases have been reported in the literature of nervous affections in association with chlorosis. When there are cerebral symptoms the suspicion at once arises that intracranial thrombosis has developed, as this condition is not infrequent in chlorosis. It is therefore of interest to note that such symptoms may occur without the existence of thrombosis and with a correspondingly better prognosis.

¹ British Medical Journal, March 31, 1900.

² Deutsche med. Wochenschrift, 1900, Band x1.

A most instructive case in point is one reported by Englehardt.¹ The case occurred in a girl, aged eighteen years, and was remarkable for the development of optic neuritis and symptoms suggestive of brain tumor. The girl had been anæmic five years previously and had improved, but suffered remissions. Vision became progressively poorer, and unbearable headache developed. In a few weeks complete blindness occurred. There was a choked disk and œdema and exudation in the retina. The diagnosis of brain tumor was made, and mercurial inunctions were tried without effect. When the patient was admitted there was slight vision, so that she could distinguish light and darkness. The pupils were dilated and did not react. The optic papillæ were cloudy and surrounded by hemorrhages and white streaks. The sense of smell was lost. The right arm was weaker than the left and the right fingers paræsthetic. The blood showed 3,000,000 red corpuscles and 50 per cent. of hæmoglobin. Loss of appetite and emaciation developed and nystagmus appeared. The knee-jerk, which had been absent on the right side, reappeared, and there was ankle clonus on both sides. Headache recurred. Some months later epileptiform attacks developed. There was a sharp cry, loss of consciousness, with general convulsions without biting of the tongue; then deviation of the eyes toward the right was noted and at times divergent strabismus. Paresis of the right facial nerve, with increasing weakness of the right arm and anæsthesia of the right side of the body, developed. The temperature sense was lost. The sense of pain was weak and slow. Lumbar puncture was attempted, but was negative. Finally death occurred, and the autopsy revealed nothing but general anæmia, with anæmia and dryness of the brain. A study of the literature of optic neuritis in chlorosis does not furnish a satisfactory explanation of the present case. The other symptoms in this case are explained by the diagnosis of a neurosis such as hysteria.

Another paper of interest in this connection is that of Neave,² who reports a case of chlorosis in a married woman, aged thirty-one years, who suffered with repeated attacks of syncope, vomiting, severe headache, numbness in the left arm and leg, delirium, and disturbance of memory. He regarded this as an instance of cerebral thrombosis, but the patient eventually recovered. In the light of the case of Englehardt, one must be disposed to be conservative regarding the diagnosis of cases of this sort, and while they are not infrequent, there are several instances on record in which neuroses with seemingly serious symptoms have arisen to make the diagnosis always a matter of grave discussion. The frequency of thrombosis is shown in the statistics presented by

¹ Münchener med. Wochenschrift, 1900, No. 36.

² Lancet, July 28, 1900.

Leichtenstein.¹ He has studied the occurrence of venous thrombosis in chlorosis in 1658 cases seen during fifteen years. Thrombosis occurred 11 times, while it is possible that milder thrombosis took place in some instances and was unrecognized. The occurrence of hemorrhage, obesity, and pregnancy favor the formation of thrombi. Of the 86 cases referred to in the literature 48 occurred in the lower extremities and 29 in the cerebral sinuses. Pulmonary embolism occurred in 10 out of 52 cases affecting the lower extremities. The cause of thrombosis in chlorosis he believes to be cardiac debility, together with changes in the blood and the interior of the bloodvessels.

The cardiac and vascular conditions in chlorosis are of intense interest both from a practical and scientific point of view. The absence of serious degenerative changes in the myocardium is rather remarkable when the frequency of such conditions in pernicious anæmia is considered, and from a practical point of view. The difficulty of determining positively the existence of an organic change as contrasted with a functional disorder is most important. Slight increase of cardiac dulness, with systolic murmurs over the body of the heart, and especially toward the base, and with a moderate accentuation of the second pulmonary sound so commonly disappear immediately after some improvement has asserted itself that the condition cannot be regarded as a permanent one. A decided increase of cardiac area, with a distinct apical murmur transmitted to the axilla and associated with clear accentuation of the second pulmonary sound, has never in my experience occurred excepting in cases of actual organic disease. The causes of increased areas of dulness may be varied, as is shown in the paper of R. Wybauw,² who believes that the increased dulness of the heart in chlorosis is sometimes the result of dilatation and at other times of upward displacement by pressure from the diaphragm. A careful physical examination will distinguish the cause in individual cases, but there are instances in which several causes are operating at the same time, as, for example, slight dilatation and perhaps displacement, and the appearances presented are those of more hypertrophy than actually exists.

But little has been added to our knowledge of the treatment of chlorosis. It will be recalled that Sir Andrew Clark laid great stress upon the importance of directing attention to the gastro-intestinal tract. The same subject is again brought up by Senator,³ who in a discussion of anæmias and their treatment suggests that in chlorosis attention to the condition of the stomach is most important. Alkaline mineral waters and hydrochloric acid may be required. Of the preparations of iron

¹ Münchener med. Wochenschrift, November 28, 1899.

² Lancet, October 6, 1900.

³ Berliner klin. Wochenschr., July 23, 1900.

he prefers ammonio-ferric chloride or the ethereal tincture of the chloride of iron. Sweat-baths have been useful in his experience, but venesection has seemed of doubtful value.

LEUCÆMIA.

Successive years demonstrate that leucæmia is a more frequent disease than has been thought in the past. Dock¹ records twenty cases seen in hospital and private practice, and expresses the view that the disease is more common in this country than in Europe. His figures show 11.3 among 10,000 cases of all sorts. Only one of his cases could be classed as acute.

Etiology. Nothing of note has been added to our knowledge of the etiology of the disease. The "parasites" or "protozoa" of Löwit seem to most observers of doubtful nature or artefacts. Dock could not find them, and Türk² regards them as artefacts, being merely granules of mast cells. Infective or other lesions of the mucous membranes have been discovered in a number of cases, especially in acute leucæmia. In connection with this subject there has appeared an interesting communication by Saundby,³ who records two cases of leucæmia, one of them being fatal. In the fatal case small, healed ulcers were found in the intestines, and an irregular, superficial ulcer that had not healed. Whether the gastro-intestinal ulcerations in leucæmia are initial or only incidental has not been discovered, though in a number of instances the connection between a primary lesion of the mucous membrane and acute leucæmia seemed very close. I have recently seen a most instructive case of this sort with Edsall, who will report the case in detail. A case recorded by E. Hirtz and M. Labbe⁴ may be cited in the same connection. The disease lasted nine weeks. There had been some form of nasal infection of obscure character, but no other cause could be discovered. They suggest that the disease was one of chronic leucæmia in which fatal septicæmia developed. The blood showed marked increase of lymphocytes, and at the autopsy bacterial emboli were found in the spleen and bone-marrow. It is very probable that cases of chronic and latent leucæmia occasionally take on an acute character and run a rapidly fatal course in consequence of a secondary infection; but the possibility of an acute origin must be admitted unless distinct evidence of the pre-existing disease has been discovered. In my own experience there have been cases of exceedingly rapid course in which the lesions

¹ Philadelphia Medical Journal, March 31, 1900.

² Wiener klin. Wochenschrift, March 29, 1900.

³ British Medical Journal, January 5, 1900.

⁴ Gaz. des Hôp., March 16, 1900.

soon grew to a character and extent that would have in the end suggested a chronic disease had not the process been observed from day to day.

The pathology of the chronic disease still seems to me analogous to that of sarcoma rather than to the diseases of manifest infectious nature. The primary myelogenous origin in the non-lymphatic cases is quite generally admitted, though some facts have been presented in opposition to this view. It cannot be regarded as a definite disproof that no satisfactory report of a myelogenous leucæmia pure and simple has been made. The disease spreads with rapidity and involves wide-spread parts in a very short time.

Rosenfeld,¹ in a report of three cases of chronic lymphatic leucæmia, reviews the theories that have been advanced regarding this disease. He states that it is a disease primary to the lymph-glands, with metastases in the various organs; second, that it is a primary disease of the lymph-glands which shows the characteristic blood picture after the bone-marrow has become diseased; third, that it is a primary disease of the bone-marrow; and fourth, that it is a disease of the lymphatic tissues in general. He himself believes that primary disease of the lymph-glands may occur, and that this was probably true of one of his cases and possibly of another. In the one there had certainly been an aleucæmic preliminary stage, and it is probable in the other. When the bone-marrow becomes involved it seems that a change in the character of the leucocytes takes place, and the clinical symptoms become more marked. He believes that evidence is against the primary myelogenous origin of lymphatic leucæmia, and in two of his cases it seemed that the involvement of the bone-marrow was distinctly secondary. Finally, he regards the process as one of wide-spread lymphosarcomatosis, and that the differences in symptoms are due to the differences in localization. Pathologists have sometimes been disposed to postulate a dual or varied nature of leucæmia on purely morphological grounds. This point of view is too restricted. The morphology of the leucocytes of the blood and in the tissues is subject to variations that might readily occasion false views of the origin or extent of the disease. The distinctions of lymphæmia and myelæmia cannot be pushed as far as has sometimes been done. The large lymphocytes found in Fränkel's acute cases would certainly have been ascribed to myelogenous activity, according to this method of study.

In the case of Petit and Weil² there was great enlargement of the lymphatic glands, and 99 per cent. of the leucocytes were mononuclear.

¹ *Zeitschrift f. klin. Med.*, Band xlii., Hefte 1 und 2.

² *Gaz. des Hôp.*, March 30, 1900.

The duration of the case was a year, and at autopsy lymphocytic transformation of various organs was discovered. The primary lymphatic origin of such a case is perhaps more certain than is that of many others so regarded, but even here a careful study from the beginning might have given a different interpretation. I do not wish to seem in opposition to the lymphatic onset of such cases any more than I would assert the invariable myelogenous character of cases of mixed leucæmia, but wish only to emphasize the necessity of a wider point of view than that derived from the study of the corpuscles in the circulating blood.

Clinical Features. Of the 20 cases reported by G. Dock¹ 11 were males and 9 females. The average age was forty-one and a half years, the youngest patient being twenty-seven years. In 5 cases there was a history of chills and fever. The examination of the corpuscles showed an average of 3,000,000, and the average percentage of hæmoglobin was 56 per cent. Dyspnœa was present in 13 cases and œdema in 10, in 7 of which there was no cardiac or kidney disease. In only 4 of the cases was there enlargement of the lymphatic glands, and in but 2 was the enlargement decided. The number of leucocytes was above 200,000 in 14 of the 15 hospital cases, the highest count being 960,000. A much more marked leucocytosis was found in the case of O. Lerch,² which was an instance of mixed leucæmia, with the remarkable blood-count of 2,020,000 red corpuscles and 3,570,000 white blood-corpuscles. It is reported that there was a large number of myelocytes.

Diagnosis. The diagnosis of leucæmia can generally be made without difficulty from the morphology and the blood-count; but there are exceptions, especially in childhood. Neither the leucocytosis, the polymorphism of the blood picture, the presence of myelocytes, nor any other single features or combination of features is wholly diagnostic. The exceptions, however, are very rare, and their true nature is generally recognized when the clinical course is considered. H. F. Müller a number of years ago referred to the resemblance of the blood in certain forms of osteomyelitis and of other diseases of the marrow to that in leucæmia, and more recently cases of various sorts have been reported like one of Lipowski.³ After stating that the diagnosis of leucæmia can generally be made from examination of the blood, he reports an instance in which this was not true. The case in question was one of carcinoma of the bowel in which there was marked leucocytosis and pronounced anæmia. The proportion of white to red cells was as 1 to 18. Nucleated red corpuscles and myeloblasts were found, and he was led to make the diagnosis of leucæmia in the absence of any distinct

¹ Philadelphia Medical Journal, March 31, 1900.

² New Orleans Medical and Surgical Journal, July, 1900.

³ Deutsche med. Wochenschrift, May 24, 1900.

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ally polymorphous nuclei, are in reality lymphocytes. This view has always seemed to me a reliable one. In the cases of Lion the disease was chronic, but it is not impossible that the same type of lymphocytes might exceptionally occur in such a case. The view of Lion was, however, supported by Vincent, and later by Widal and Merklen,¹ incidental to a report of an instance of lymphatic leucæmia, in a man, aged fifty-six years. The lymphocytes in this case constituted practically all of the leucocytes. At the autopsy the spleen was much enlarged, and the bone-marrow consisted of a tissue containing nothing but lymphocytes. The tissue of the spleen was found to have the same construction. Widal agrees with Lion that there are two types of leucæmia having predominance of the mononuclear elements, the one being lymphocytic and the other showing conspicuous increase of the mononuclear cells. This subject certainly merits more extensive study.

Acute Leucæmia. Attention has often been called to the difficulty of determining the onset of a case of leucæmia and to the danger of confounding a sudden exacerbation in chronic leucæmia with an acute disease. The clinical course is, however, so very different in typical instances that there cannot be much difference of opinion; in the atypical cases the character of the blood picture is more reliable as a diagnostic criterion than is the history of the cases. In a discussion of this subject, in connection with an instance of acute leucæmia in a woman, aged twenty-two years, Dennig² states that he believes the distinction between acute and chronic cases is more properly based upon the manner of onset than upon the duration. Weakness and prostration, headaches, difficulty in swallowing, hemorrhages, and stomatitis are important early symptoms. Pain in the left side connected with the spleen, with or without splenic enlargement and tenderness of the lymphatic glands, is important. The blood picture is characterized by increase in the mononuclear leucocytes. In every case of stomatitis a blood examination should be made. The author very properly recognizes the indefiniteness of onset in many cases. The symptomatology may be fully established before the condition of the blood is suggestive, or, on the other hand, a reverse state of affairs may occur. An illustration of the former sort was reported by H. Reimann.³ The patient was a girl, aged nine years, who suffered with indefinite symptoms, followed by hemorrhages from the nose and a purpuric eruption. Leucocytosis, enlargement of the liver, spleen, and lymph-glands followed. Examination of the blood showed at first an increase in the polymorphonuclear elements and later of the leucocytes. There was slight increase of the eosinophiles. There was

¹ *Gaz. des Hôp.*, March 16, 1900.

² *Münchener med. Wochenschrift*, September 11, 1900.

³ *Wiener klin. Wochenschrift*, September 28, 1899.

fever, and in the late stages of the disease pigmentation of the skin. The case ran a course of six weeks, and at a count of the blood just prior to death the red corpuscles were reduced to 450,000, while the white cells had increased to 200,000; the hæmoglobin was estimated at 8 per cent. The autopsy showed as the most conspicuous feature great enlargement of the thymus gland. The preliminary increase of polymorphonuclear cells is of interest in connection with the supposed infectious character of acute leucæmia. It has not, however, been noted by others. The marked enlargement of the thymus gland is noteworthy and might be taken by some as an indication that there was a chronic leucæmic substratum on which the acute malady developed. A similar point of view could be taken with as much propriety in regard to the case of McCrae.¹ The patient was a male child, aged three years. The child was fretful for a few days before admission to the hospital and had adenoids and enlarged tonsils. The liver and spleen were somewhat enlarged and the latter organ hard. There was no general glandular enlargement. The blood examination the next day showed 1,680,000 red blood-corpuscles, 26,000 leucocytes, 35 per cent. hæmoglobin, and the differential count showed 86.5 per cent. lymphocytes (of which 41.5 per cent. were small and 45 per cent. were large forms). About two weeks later the blood-count showed 21,800 leucocytes, with 98.6 per cent. of lymphocytes, large and small. Some days prior to this the number of leucocytes had been 60,800 and the percentage of lymphocytes 99.2. After removal from the hospital the child had epistaxis, convulsions, and hemorrhages into the skin. In a search through the literature the author collected 13 cases of acute leucæmia in the first decade of life. Of these 11 were males. In 8 cases there was fever; in 4 general glandular enlargement; in 5 enlargement of the cervical glands alone; in 2 no enlargement, and in 2 no record of this matter. The spleen was enlarged in all; the liver was enlarged in 3, not enlarged in 3, and in 2 its size was not noted. The red corpuscles were reduced in number in 8 of the cases in which a record was made. They ranged from 1,000,000 to 2,350,000. The continuous increase in the proportion of lymphocytes is notable, but there was not at any stage an increase of the polymorphonuclear cells, such as Reimann observed.

W. N. Bradley² records an instance of fatal acute lymphæmia running a course of eight weeks. The patient was a boy, aged eight years, who presented enlarged glands, fever, shortness of breath, and splenic enlargement; 59 per cent. of the leucocytes were lymphocytes. The total number of leucocytes was 85,000 and the red corpuscles were reduced below 2,000,000.

¹ Johns Hopkins Hospital Bulletin, May, 1900.

² New York Medical Journal, December 23, 1899.

Complications in Leucæmia. Complications, as White¹ insists, have a special interest in leucæmia, as some of them tend to alter the blood picture so greatly that the diagnosis may be impossible. This remark applies especially to acute infections. Among others, acute miliary tuberculosis has been found to operate in this way. The chronic disease does not appear to do so.

Elsner and Groat² report a case of spleno-myelogenous leucæmia in association with pulmonary tuberculosis. This association is so rare that there is practically no literature. Their patient was a baker, born in Ireland, aged forty years, who had lived in favorable surroundings, and had always been of good habits. The family history was of no consequence. There was no specific history. He first complained of fulness in the abdomen and then noticed an increase in its size. This had lasted for many months before the disease became marked. He finally grew very weak, so that he was forced to discontinue his work. The abdomen in the meantime increased in size. Later his color changed, becoming sallow and pale, and finally night-sweats developed, together with cough of a troublesome character. At this time he consulted a physician, who discovered a tumor in the abdomen, which led to his being sent to the hospital. There was irregular fever and a sallow, anæmic color. He developed pleurisy, and during three weeks had a continuous temperature averaging about 102° F. Expectoration, sometimes blood-tinged, developed; but tubercle bacilli were not found in the sputum at this time, but were subsequently discovered. Later he developed areas of dulness in the lungs and exaggerated breathing, with increased fremitus. There was also tuberculous ulceration of the pharynx. The examination of the blood at different times showed a number of the red corpuscles ranging from 3,200,000 to 2,922,000; the leucocytes from 320,000 to 121,500. The differential count showed a somewhat reduced percentage of polymorphonuclear neutrophils and from 38 per cent. to 17 per cent. of myelocytes; from 7.5 per cent. to 4.1 per cent. of lymphocytes; from 6.5 per cent. to 3.5 per cent. eosinophiles, with occasionally considerable proportions of basophile cells and a few transitional cells. The enormous number of myelocytes marked the case as spleno-myelogenous leucæmia. In a search of the literature the authors have been able to find only four well-authenticated cases of tuberculosis in leucæmia, those reported by Quincke, Stintzing, Lichtheim, and Baldwin. In the first of these miliary tuberculosis developed in a case of mixed leucæmia, with a decrease in the number of the characteristic features of leucæmic blood as the tuberculosis advanced. In the second case lymphatic leucæmia was associated with chronic tuberculosis. The

¹ Loc. cit.

² American Journal of the Medical Sciences, March, 1901.

leucæmia in this case improved as the tuberculosis advanced. In the third case the leucæmia was of a lymphatic character, and as the tuberculosis developed the leucocytes decreased in number. In the last case, which was confirmed post-mortem, there was lymphatic leucæmia with tuberculosis. As the tuberculosis advanced the number of leucocytes increased, but the red corpuscles decreased in number. Some other cases are reported, but are of less certain character.

Diseases of the inner ear and middle ear are not unusual. Hemorrhages and leucæmic infiltrations are the most frequent conditions. P. Weber¹ records an instance of leucæmia in a man, aged 31 years, who had the symptoms of Ménière's disease and in whom the post-mortem examination showed disease of the inner ear without change in the nerve-trunks.

Dermal Leucæmia. Primary or secondary involvement of the skin is rare, and unfortunately the diagnosis is far from certain. Among the earlier instances a large proportion is doubtful because leukocytosis and leucæmia were not differentiated, and in other cases the condition of the blood was ignored, the diagnosis having been made by examinations of the local lesions. Somewhat clearer ideas are now entertained, and recent reports give promise of a proper understanding of the subject. Incidentally, the complicating conditions in the skin, such as hemorrhages, eruptions, etc., merit discussion.

Nékám² has studied leucæmic disease of the skin in connection with a report of four cases seen in the clinic of Professor Ketley. He distinguishes two groups of cases. Among the first are such conditions of the skin as are due to disturbed circulation. Among these are pallor, jaundice, pigmentation, pruritus, hyperhidrosis, and furunculosis. He reports three cases of this sort which have been under his observation. As contrasted with these conditions is the truly leucæmic disease of the skin with formation of nodular masses resembling heteroplastic lymphomata. This condition must be distinguished from the more numerous cases of secondary leukocytosis following tumors of the skin. The lymphoderma perniciosum of Kaposi he regards as a mycosis, and therefore distinguishable from true leucæmia.

The one case of true leucæmia of the skin occurred in a woman, aged forty-one years, who suffered with an eruption of soft nodules in the skin of the forearm. At first these were scarcely reddened, but subsequently they became quite dark red from rubbing. There was marked itching at times. Subsequently the left leg, the breast, and the abdomen became involved. The skin of the patient was yellowish

¹ British Medical Journal, March 3, 1900.

² Monatsheft. f. Prakt. Dermatol., 1899, ii.

and there were diffuse brownish pigmentations. The lymphatic glands were enlarged. The bones were painful on percussion. There were punctiform hemorrhages in the skin. Subsequently the number of red blood-corpuscles were compared, and that of the white was as 3.5 to 1, and of the white corpuscles 96 per cent. were lymphocytes. This case is evidently one of lymphatic leucæmia with dermal lesions.

Oertel¹ states that three kinds of cases have been reported. In the first the lesions are small, circumscribed nodules, in size from a pin-head to a hazel-nut, of pale or slightly brownish or reddish color, scattered over the body. In the second class a few solitary elevated lobulated nodules are found. In the third class the lesions are more diffuse, having a moist, eczematous appearance, or they have the form of ulcerating tumors. The author quotes the recent investigations of Nékám, who holds that some of the cases recorded as leucæmia of the skin, particularly of cases that would fall in the third group, are instances of other diseases. He admits the cases of Biesiadecki, Hochsinger and Schiff, Neuberger, and his own. Nékám believes the nodules of the skin are true infiltrations. The true leucæmia of the skin is recognized by the occurrence of nodules in a case of undoubted leucæmia. The nodules must be exclusively the result of diapedesis, and the cells, at least the bulk of the cells, undergo no metamorphoses. The case reported by Oertel was a man, aged forty years, who had been ill for two years. There was considerable enlargement of the spleen that had been regarded as malarial. Some time before death nodules appeared in the skin, first on the chest and arms and then on other parts. A blood examination showed enormous increase in the white corpuscles, with myelocytes and eosinophiles. He was not seen after this, but a partial autopsy was obtained. Section of the nodules of the skin showed no change in the epidermis and upper part of the cutis. The lower part was the seat of dense, small cell infiltration, most of the cells being lymphocytes. There were also polymorphonuclear leucocytes and eosinophiles. No myelocytes could be found or identified. Only an occasional plasma cell could be found. There were a few red blood-corpuscles and no mitoses.

Pinkus² reports three cases of leucæmia, with tumors in the skin. These cases occurred in a person of advanced years, and were instances of lymphatic leucæmia. The author points out that the same microscopic features may occur in cases of pseudoleucæmia as are found in lymphatic leucæmia, and as far as the blood is concerned there may be a gradual transition from one to the other disease. With this thought

¹ Journal of Experimental Medicine, November, 1899, vol. iv.

² Archiv. f. Dermatol. und Syph., 1899, 1.

in view he distinguishes three classes of tumors of the skin associated with lymphæmia: (1) Lymphatic tumors; (2) combination of true sarcoma with lymphatic leucæmia; (3) combinations of mycoses, dermacycoses resembling mycoses fungoides, with lymphatic leucæmia.

Treatment. Arsenic alone seems to have power to do good in leucæmia, and even this is uncertain. Its effects, as far as is known, are only temporary, but may be most striking. There is rarely difficulty in administration, and when such difficulty arises the mode of exhibition of the drug may be at fault. I have recently had under my care a case of lymphatic leucæmia in which it was reported that arsenic in the form of the bromide had been irritating and disturbing in various ways. I found no difficulty in administering Fowler's solution in ascending doses, the maximum quantity finally far surpassing the quantities of the drug that could not be tolerated before. The difficulty had been that the doses of the drug were increased too rapidly. Charles Heaton¹ reports a case of spleno-myelogenous leucæmia in which arsenous acid and arsenate of soda were administered in large doses with remarkable tolerance on the part of the patient; $5\frac{1}{2}$ grains of arsenous acid and 105 grains of arsenate of soda were given hypodermically during 271 days, including intermissions aggregating fifty-three days. Temporarily the effect upon the blood was beneficial.

A striking instance of the temporary usefulness of arsenic is reported by McCrae.² The patient was a man, aged twenty-eight years, and the remarkable feature of the case was the disappearance of the splenic enlargement and the myelocytes of the blood. The patient became ill in August, 1897. Early in 1898 he had a great splenic enlargement, and the blood examination showed 2,680,000 red corpuscles, 584,000 leucocytes, and 45 per cent. of hæmoglobin. There were at that time 23 per cent. of myelocytes. Under treatment with arsenic the blood improved to such an extent that red cells numbered 4,640,000, the hæmoglobin registered 68 per cent., and the leucocytes had fallen to 9250. No nucleated cells or myelocytes could be found, and the spleen could just be felt on deep inspiration. The patient was kept under observation for some time, during which there was a partial recurrence of the symptoms, with subsequent improvement. The spleen again decreased in size and the myelocytes and nucleated red cells disappeared from the blood. Some months after this he passed from observation. He died suddenly, and the physician in charge thought it was due to cerebral hemorrhage. The author states that no previous similar case has been recorded. This is probably true of disappearance of the splenic enlargement with subsidence of leucocytosis; but, as far as the blood

¹ Lancet, January 26, 1901.

² British Medical Journal, March 31, 1900.

alone is concerned, we have ourselves observed an entire disappearance of leucocytosis and of myelocytes.

Operative interference in leucæmia is always more or less dangerous, but is occasionally well borne, as in the case of Murrell and Spencer.¹ The patient, a girl, aged nineteen years, suffered with ascites complicating leucæmia. An operation was undertaken and four quarts of blood-stained fluid were removed. A collateral circulation was established by epiplopexy. The suprarenal veins enlarged and the patient gained considerably in general health. The case was thought to be one of lymphatic leucæmia.

MYELOMA.

This rare condition is properly introduced at this point on account of its resemblance in a pathological sense to myelogenous leucæmia. The proper classification may, however, place the disease elsewhere, as the studies of the blood, etc., in such cases as the following suggest: Kalischer² records a case of myeloma of the ribs in a woman, aged sixty-seven years, in which there were neuralgic pains interfering more or less with breathing. Later, spontaneous fracture of the ribs formed nodules in the healing. The diagnosis was made by the discovery of the Bence-Jones body in the urine, the usual reaction for which was discovered, namely, precipitation with moderate heat, solution upon boiling, and reprecipitation upon cooling. Death occurred after a year and a half, and at the autopsy the marrow of the ribs was found converted to a spleniform, pulpy mass. The author comments on the lack of blood changes in his case as in other cases reported in the literature. He also remarks upon the absence of the Bence-Jones body in the urine in cases of leucæmia, pernicious anæmia, etc., in which the marrow is profoundly affected.

T. R. Bradshaw³ discusses albumosuria in association with myeloma under the title of myelopathic albumosuria. Pathologically, there is a cellular growth in the cancellated tissue of bone involving the ribs, sternum, and vertebræ. The bones become very thinned, being reduced to mere shells, and spontaneous fractures frequently take place. The interior is composed of a gelatinous mass which, under the microscope, shows round and spindle-shaped cells. There is generally pain in the lumbar region, with increasing anæmia and not infrequently deformities due to fractures. The patient is usually in the second half of life, and more commonly of the male sex. Increasing weakness marks the progress of the disease, and the affection is likely to be mistaken for

¹ Lancet, June 16, 1900.

² Deutsche med. Wochenschrift, January 24, 1901.

³ British Medical Journal, November 3, 1900.

muscular rheumatism, osteomalacia, or tuberculous disease of the spine until the examination of the urine corrects the diagnosis. The peculiar reaction of this body is its coagulability at a relatively low temperature and its re-solution on boiling. Strong mineral acids precipitate the substance, but boiling re-dissolves the precipitates. The terminal outcome of the disease is always fatal, but it may be of long duration.

SPLENIC ANÆMIA.

But little has been added to our knowledge of the nature of the various forms of disease which present themselves under the clinical guise of what has been called splenic anæmia. Authorities are now practically as one in declaring that there is no single disease which may be designated by this term. Several types of disease have been recognized, such as the type of splenic enlargement with atrophy of the liver, described by Banti, and the type described by a number of French and English authors, in which hypertrophic cirrhosis of the liver has coexisted with a disproportionate enlargement of the spleen. These clinical subdivisions do not, however, help us out in the way of a better understanding of the essential nature of the conditions described. It is possible that some of the cases may be instances of simple cirrhosis of the liver in which, under conditions not well understood, the splenic enlargement has become excessive, and others may be examples of simultaneous disease of the spleen and liver due to the same cause. In still others the conditions may be wholly independent of each other. The mere occurrence of splenic enlargement that cannot be accounted for does not constitute sufficient ground for the assumption that there is a specific disease process, as may be seen in a recent case reported by Dalton.¹ This case was one of anæmia, with enlarged spleen, presenting the clinical characteristics of splenic anæmia. The patient died suddenly, and at the autopsy there were found great distention of the stomach, rotation and strangulation, and finally perforation. The enlargement of the spleen was probably due to torsion of the splenic vein. Dalton believes, as we do, that splenomegaly is not a pathological entity, and sees no reason for separating this condition from other diseases. In the discussion Kidd also expressed doubt about the existence of splenic anæmia as a special disease, and reported two cases of cirrhosis of the liver with great enlargement of the spleen and marked anæmia, and suggested that some of these might have been regarded as cases of splenic anæmia. The unusual cause of the splenic enlargement in Dalton's case could scarcely have been thought of, and the anæmic state of the patient

¹ *Lancet*, November 18, 1899.

had abundant cause independent of the spleen. A. O. J. Kelly¹ reports a case of splenic anæmia in a girl, aged twenty-two years. The patient had pain in the splenic region in the summer of 1899, and the spleen was found to project below the ribs. Later it increased in size, and the blood examination showed 50 per cent. of hæmoglobin and 3200 leucocytes. There was a systolic murmur over the base of the heart. Two slight attacks of pain in the joints occurred and were regarded as rheumatic. Under *nux vomica* and Fowler's solution there was improvement for a time. Fever ranging from 100° to 103° F. occurred, bleeding from the external genitalia was observed, dyspnœa grew extreme, and death took place in June of 1900. No autopsy was obtained. The differential diagnosis from ulcerated endocarditis caused considerable difficulty. This case is interesting in connection with that of Dalton, as it is an example of unexplained enlargement of the spleen with associated conditions sufficient to raise a large doubt as to the primary splenic nature of the malady, and after all, even in the most typical instances of splenic anæmia so called, the primary splenic nature may be doubted. The case of Guillaïn,² one of cirrhosis of the liver and pancreas with splenomegaly, is very interesting. The patient was a woman, aged fifty-two years, who had had no illness excepting small-pox in childhood. She suddenly became jaundiced and remained so persistently for nine months before death took place. Examination of the patient had determined a considerable enlargement of the liver and a notable increase in the size of the spleen. The other organs seemed to be normal, and the urine, excepting for the presence of bile and indican, was normal. Nasal and gastric hemorrhages took place, and death finally occurred from increasing jaundice. At the autopsy the liver was found to weigh 2150 grammes and the spleen 1900 grammes. Both were decidedly sclerotic, the cirrhosis of the liver being mainly in the distribution of the biliary ducts. There was even more distinct sclerosis of the pancreatic tissue. The author could find no definite cause for the disease, but believed that there had been a simultaneous infection of the liver and pancreas, with a resulting disease of the spleen. The author's explanation of the case is a not unlikely one, but there is still a doubt as to the cause of this special enlargement of the spleen. One expects enlargement of the spleen in cases of cirrhosis of the liver, but there must be in certain instances special causes that operate to make this enlargement excessive.

Studies in the pathological anatomy of the organ in splenic anæmia have thrown but little light on this question, as the reports have been very conflicting. The majority of cases that have been examined patho-

¹ Medical News, January 12, 1901.

² Revue de Méd., 1900, xx.

logically have shown hypertrophic cirrhosis, an overgrowth of the trabeculae and supporting connective tissues of the spleen, without special involvement of the true splenic tissue. In a few instances, as in the very interesting case of Bovaird, proliferation of endothelial cells has been found, and has been so excessive as to suggest a diffuse endotheliomatous growth. These cases more than any others would seem to merit separate consideration as instances of a special disease of the spleen, but the number of such has been very small.

Sometimes the term pseudoleucæmia splenica has been given to splenic anæmia, and indeed this term has been more widely accepted than the facts would seem to justify. In very few instances have the pathological lesions borne any similarity to those seen in the spleen in leucæmia and ordinary pseudoleucæmia. A case of what seems to be true pseudoleucæmia splenica has been recently reported by W. Türk.¹ There was anæmia, with irregular fever and great enlargement of the spleen and liver, in a man, aged fifty-six years, who had given a specific history. There was no leucocytosis, and the case was regarded as one of splenic pseudoleucæmia. At the autopsy lymphosarcoma of the retroperitoneal glands was discovered, the glands of the spleen, the mediastinum, and some other glands being also involved. In addition, the spleen presented the appearance of chronic congestion. Histologically, the tumors consisted of mononuclear leucocytes, with little reticulum. After a discussion of the general question the author offers as a classification: (1) Partial lymphomatosis, in which there are local non-destructive enlargements; (2) universal lymphomatosis, with general lymphoma; (3) lymphomatosis destruens, in which there are destructive forms of lymphoma; (4) lymphosarcomatoses that occur locally and cause metastasis. He does not believe that pseudoleucæmia, as ordinarily described, indicates a single morbid process. The enlargement of the lymphatic glands in this case precludes its classification among instances of splenic anæmia in the ordinary sense, and the clinical history was unlike that of splenic anæmia. The great enlargement of the spleen was, however, an objective symptom that would readily have inclined anyone to this diagnosis. It would be unwarranted, however, to pretend to draw any conclusions from such a case as to the probable pseudoleucæmic nature of other cases of splenic anæmia, and to consider this as an instance of a transitional form of disease. E. J. Brown² has recently spoken of the relations of leucæmia and splenic anæmia. These relations, however, are wholly clinical and in nowise based upon pathological observations.

¹ Wiener klin. Wochenschrift, October 5, 1899.

² Philadelphia Medical Journal, January 12, 1901.

PURPURA.

The classification of purpura among the blood diseases is one of convenience only. It is possible at the present time to distinguish between forms of purpura having the same outward appearance but very different causes, and the condition has found its proper place as a symptom rather than a disease. Nevertheless, in its results as well as in its clinical manifestations, there is sufficient resemblance between cases having widely divergent causes to justify a discussion in one place rather than under the heads of Intoxications, Infections, Nervous Disturbances, etc. It is always well, however, to bear in mind the diverse character of the causes. Sometimes these are entirely obscure, as in the case of Nehr-korn,¹ who reports an instance of hemorrhagic purpura without any discoverable cause, in a man, aged twenty-six years. Hemorrhages occurred from the mucous membranes, and at the autopsy extensive ecchymoses were found in the internal organs as well as endocarditis of the mitral and aortic valves. The staphylococcus aureus was found in the blood during life. The discovery of micro-organisms, and especially of the staphylococcus in the blood, does not at once proclaim the disease as dependent upon that particular organism, though it is highly suggestive. If the organism in question was the cause of the purpuric condition this case must rank as one of cryptogenetic sepsis, which is after all the foundation of many cases of purpura. As contrasted with these instances, I may refer to the cases of purpura occurring in the course of or after well-defined infections such as the fevers, suppurative diseases of the appendicial region, or of the gall-bladder, pneumonia, etc. An instance of this kind was recently reported by P. Edel.² The case was one of purpura rheumatica, following ten days after the onset of pneumonia, in a man, aged forty-one years. There was first a severe bronchitis with albuminuria; then purpuric spots developed in one arm. Fresh hemorrhages followed until almost every part of the body was covered. A number of distinct hæmatomata developed in different parts of the body, but all occurred on the left side. Recovery eventually took place. In discussing the nature of this case the author points out that there was no history of hæmophilia and no evidence of scurvy. He believes that it was not an instance of sepsis, for examination of the blood showed no bacteria, and there was no leucocytosis or any involvement of the heart. Beside this the spleen was not enlarged, and the peculiar unilateral occurrence of the hæmatomata does not accord with the diagnosis of sepsis. He believes, therefore, that some nervous

¹ Münch. med. Wochenschrift, October 2, 1900.

² Deutsche med. Wochenschrift, September 27, 1900.

vasomotor influence was at work. There was a peculiarly increased rapidity of the coagulation of the blood. So much was this the case that it was difficult to get the blood for ordinary clinical examination. A point of interest in the latter was the increased number of blood plates. It is by no means certain that the absence of bacteria from the cultures of the blood and the absence of leucocytes proves the non-existence of a septic state and the non-septic character of the purpura. It is precisely in the cases of intense sepsis with absent leucocytosis that purpura would be apt to occur, and the failure of the cultures is so common that no great weight should be given to this fact. The unilateral occurrence of purpura would, of course, strongly indicate a central nervous influence.

It is not improbable that there may be instances of purpura which form a bridge of relationship between the ordinary purpura due to infection, intoxication, and the like, and hæmophilia; that is to say, there may be cases of purpuric tendency due to some constitutional or structural defect. In this group I would class the case reported by R. Muir.¹ The case was one of purpura in a lad, aged fourteen years, in whom there was marked anæmia. The illness began with a chill, followed by hæmoptysis. When admitted to the hospital there was oozing from the gums, and anæmia had become quite severe. Bleeding from the nose, hæmoptysis, and finally general purpura developed. Some improvement occurred, and later another attack of purpura, followed by vomiting of blood and profound anæmia in which the blood-count was 800,000 red corpuscles, 7000 white corpuscles, and 11 per cent. of hæmoglobin. The red corpuscles were much altered in shape, but no nucleated corpuscles were seen. The differential count of leucocytes showed a reduction of polymorphonuclear forms to about 25 per cent., while the lymphocytes constituted 70 per cent. of the total number. Eosinophile cells were practically absent, as were also the blood plates. At the autopsy the bone-marrow was found to be almost exclusively fat and without any of the red color seen in the anæmias. Microscopical examination showed a practical absence of red corpuscles and of normal marrow cells. There was no deposit of pigmentation in the marrow. The condition of the marrow and of the blood in this case might justify a classification of the case as one in which there was some primary developmental defect, but our knowledge of the anatomy and pathology of the marrow is so rudimentary that it would be unwise to insist too strongly upon this point. As far as the differential count of the leucocytes is concerned the marked lymphocytosis presented in this case does not differ widely from that which I have seen in cases of

¹ British Medical Journal, September 25, 1900.

purpura of the ordinary type in older patients, and does not therefore warrant a positive conclusion as to the state of the bone-marrow. In connection with this case, and with the subject of purpura due to constitutional or structural conditions, an interesting report is made by S. S. Burt.¹ He describes an interesting case of hemorrhagic diathesis in a boy, aged eleven years, in whose family tuberculosis figured largely, and in which two other children had suffered with slight purpuric eruption. The boy had been operated upon for enlarged glands of the neck the year previously. The bleeding began from the gums and purpura of the skin developed about the same time. Subsequently he grew anæmic and weak and there was some fever. Red and white corpuscles and tube-casts were found. On the seventh day hæmoptysis and melæna led into a condition of stupor and delirium, and death occurred on the tenth day. The nature of the case was not determined. The possibility of a special infection was therefore left uncertain. The clinical history of this case was more distinctly that of pure hæmophilia, but the occurrence of purpura in other members of the family and the decided purpuric symptoms in this case make it of interest in connection with the subject we are discussing.

Hemorrhages from the mucous membranes of different parts of the body are, of course, well-known symptoms of purpura, and among other sources the kidney ranks as a rather frequent one. Hæmoglobinuria, occasional or paroxysmal, is not in itself to be ranked as a purpuric condition, though it is easily conceivable that certain forms of hæmoglobinuria belong in the same group as cases of purpura having the same causes and in a general way the same pathological nature. Recently, L. Michaelis,² in reporting a case of hæmoglobinuria, states that he regards it as an instance of a condition not previously described. The patient, a woman, aged forty-one years, had suffered a severe internal hemorrhage, with large effusion of blood in the abdominal cavity. This blood was rapidly absorbed, and for two days after the accident she had hæmoglobinuria, then a cessation of this, and during four subsequent days another attack. His belief is that there was absorption of a large quantity of hæmolysin, with a subsequent destruction of red corpuscles. The freedom from such hæmoglobinuria after partial hemorrhages he ascribes to the slow absorption of the hæmolytic agent, and the neutralization of this being antiautolysin. Another suggestion has occurred to him that the hæmoglobinuria in his case was due to the absorption of large quantities of hæmoglobin. I have known of slight hæmoglobinuria from a similar cause in several cases, but it is not often

¹ Boston Medical and Surgical Journal, November 1, 1900.

² Deutsche med. Wochenschrift, January 26, 1901.

that the degree of hæmoglobinuria or the duration of the condition is as great as occurred in Michaelis' case.

Treatment. The treatment of purpura is unsatisfactory unless a distinct cause is recognizable, but various internal styptics have been employed. Among these, calcium salts appear to have done good in some cases, and recently gelatin has been used with good effect by several clinicians. The case of hæmaturia in which Schwabe¹ found decided benefit from injections of gelatin was not a purpuric case, but illustrates the usefulness of gelatin in hemorrhages not approachable directly. Schwabe does not believe this treatment will always prove satisfactory, though he thinks it should be tried.

HÆMOPHILIA.

But little has been added to our knowledge regarding hæmophilia. No satisfactory explanation of the disease can as yet be offered, the only generally accepted morbid condition being a decreased coagulability of the blood. It is not improbable that some instances of uncontrollable hemorrhage often regarded as hæmophilia are properly classed among purpuric conditions. This is particularly true of the spontaneous hemorrhages of the new-born, a subject which has recently been discussed by Paulsen.² Among the causes of umbilical hemorrhages of this sort the author refers to acute fatty degeneration of the new-born, congenital syphilis, and general sepsis. Some rare cases of umbilical hemorrhage due to hæmophilia may be added. Out of 228 cases observed by Grandidier 14 were due to hæmophilia. Paulsen's case occurred in a child, nine days old. After other methods had failed suturing was attempted, but the bleeding continued from the stitches and the child perished.

A report of a case of hæmophilia in a negress, published by Steiner,³ is of interest on account of the rarity of the disease in the negro race. The author states that only one other case has been recorded. The one referred to was that of Dr. Haddock, reported before the Academy of Medicine of Cincinnati in 1874. Steiner's case was a colored girl, aged fourteen years, who was bleeding from the nose and mouth. She had bled on the slightest provocation since childhood. She had had during two and a half months before coming under observation three severe hemorrhages from the nose, accompanied by severe headache. There was sponginess of the gums and a few petechiæ about the elbows

¹ Therapeut. Monatsheft, 1900, No. 6.

² Münch. med. Wochenschrift, November 13, 1900.

³ Johns Hopkins Hospital Bulletin, February, 1900.

and knees. The coagulation time of the blood was between three and four minutes. Fifteen grains of calcium chloride three times a day caused improvement. A study of the family history in this case shows that the great-grandmother was a bleeder from childhood to her death. She had fourteen children—ten boys and four girls. The patient's mother knew seven of the fourteen, all of whom were bleeders, and the grandmother and the mother of the patient were also bleeders.

After the publication of this case another was reported to me by a physician who had seen the account of Steiner's case. Unfortunately, I have now mislaid the data and the name of the physician, who was unknown to me.

Among the more obscure and therefore especially interesting symptoms of hæmophilia those of the joints have attracted much attention. Their chief importance lies in the diagnostic relations. Many cases, as König some years ago pointed out, have been mistaken for tuberculous joint disease, and the differential diagnosis cannot always be made with ease. The disease of the joints usually takes the form of a swelling, due to bloody effusion, though at times the liquid is more serous than hemorrhagic. An interesting report in this connection is made by Hibbs,¹ who describes two cases of periodic hemorrhage into the knee-joints in brothers; two other brothers died in infancy of hæmophilia. In some cases of this sort the involvement of the joint may appear in a periodical fashion, coming and going without definite cause. In such instances difficulty might arise in distinguishing the affection from cases of hydrarthrosis, such as those recently reported by T. Bende.² He describes two cases—one, an instance of intermittent hydrarthrosis in a man, aged forty-nine years, in whom the attacks had occurred twice a year during nineteen years. They began with severe pain, which greatly subsided in the course of three weeks; then followed a return of the swelling, lasting a few days. The second case occurred in a man, aged sixty-one years. The attacks recurred at intervals of about four weeks. The author collects fifty-five other cases from the literature.

INFANTILE SCURVY.

The exact cause of this condition is unknown, and the mode of operation of the dietary vice, which is undoubtedly the immediate occasion of its occurrence, is wholly obscure. Infection has thus far received little consideration and does not appear to be a likely explanation. Some clinical or metabolic disturbance is more reasonable, but

¹ New York Medical Journal, January 19, 1901.

² Allg. med. Central.-Zeitung, 1900, Band xlv. und xlv.

in the light of present knowledge it is very doubtful if the view of A. E. Wright¹ is justified. In discussing the treatment of scurvy he classifies this condition as one of acid intoxication, and points out that it occurs in human beings when the diet is such as to produce an excess of acid. He records the examinations in a number of cases of scurvy to show that the alkalinity of the blood was greatly decreased. Better proof of the existence of acid intoxication is needed, such proof, for example, as could be obtained from a systematic study of the urine to determine the ammonia excretion. The methods for determining alkalinity of the blood are so untrustworthy that the results cannot be accepted unless they are confirmed by other facts.

But little is now heard of the supposed rhachitic nature of the disease, which at one time was a generally accepted view. The pathological studies of the bones and other organs have fully justified its classification as a form of scurvy. In a recent publication Jacobsthal² records a study of the conditions of the bones and other structures in Barlow's disease. The case occurred in a child, aged eight months, and there were hemorrhages in the skin, moderate swellings of the skull, and slight hydrocephalus. There were also small hemorrhages in the serous surfaces and hemorrhages into the lungs, muscles, periosteum, bone-marrow, and subperiosteal tissues. There was not manifest anemia. The number of the hemorrhages in the lungs was striking. There was no change in the gums. The bones showed hemorrhages in the periosteum and the epiphyseal junctions, but only to a slight extent in the marrow. These hemorrhages caused a disappearance of the osseous tissue, especially at the ends. Secondly, there was an inflammatory process, with formation of spindle cells and masses of tissue. The case, according to the author's investigations, showed a very slight resemblance to rickets, but a decided resemblance to scurvy in its pathological relations.

Diagnosis. The clinical features are so well known that they make diagnosis easy in most instances. Infants are, however, so rarely examined with care that errors in diagnosis are often made through insufficient observation. J. P. C. Griffith³ remarks that the disease is generally very easy to recognize and to treat. Sometimes, however, it is difficult of recognition. He details sixteen cases seen within a year and a half in which the resemblance of symptomatology had suggested the diagnosis of rheumatism. With regard to the nature of the disease, he states that while it is clearly a dietetic malady there is no one dietetic fault that is responsible. Generally, the children have been fed upon commercial

¹ *Lancet*, August 25, 1900.

² *Beiträge zur Path. Anat. und Allg. Pathol*, 1900, xxvii.

³ *Philadelphia Medical Journal*, February 2, 1901.

foods, as was shown by the collective investigation of the American Pediatric Society. In the matter of diagnosis he calls attention to the fact that the gums are not generally involved in the beginning, and are usually healthy if no teeth have appeared. Pain about the legs is usually the first symptom, and this has led to the mistaken diagnosis of rheumatism in many cases. With regard to treatment, the rectification of the diet is the most important element. He has seen but one fatal case, in which death occurred from inanition, the result of enterocolitis. Fruit juices caused a prompt recovery in several of his cases without any other change of diet.

Hobart A. Hare¹ records several cases of scurvy in infants, remarking that the peculiar characteristics of the disease are the grave appearance of the child, the rapidity with which it improves under proper treatment, and the rarity with which it causes death without the inter-currence of some other malady. Of the cases reported one was seen by him before scurvy had been recognized as a common disease. The child was a year old and cried bitterly whenever it was moved, especially when such movement involved changing the position of its back. An orthopedic surgeon was misled by this, regarding the condition as one of spinal disease, and prescribed mechanical treatment. Subsequently the diagnosis of infantile scurvy was made and the child was promptly relieved by treatment. The second case occurred in a family in which three children had died with vague diseases that had been regarded as meningitis, cerebro-spinal meningitis, and "spinal trouble." The fourth child seemed to the parents to be showing the same symptoms. It cried incessantly, especially when it was carried about. The gums were slightly spongy, but there was nothing else discoverable. Anti-scorbutic regime was followed by extraordinary rapidity of cure. In the third child the signs of scurvy were more distinct, though the diagnosis had not been thought of at first, as the child was fed on the best cow's milk procurable, with the addition of a well-known artificial food. Proper regime relieved the child. In drawing a distinction between scurvy and rickets the author notes that the former is a disease of the well-to-do in contradistinction to the latter, and it rarely appears at hospital dispensaries.

DIABETES MELLITUS.

The interesting questions in connection with diabetes are: (1) The fundamental causes that operate to bring it about and (2) the disturbances of metabolism that underlie or attend the disease. A study of

¹ Medical News, February 16, 1901.

the chemical processes involved in nutrition in health and in this disease demonstrates beyond all question that it is primarily one of disorder of the carbohydrate metabolism. The ingested carbohydrates are for the most part absorbed as dextrose, converted into glycogen in the liver and muscles as storehouses, and delivered to the blood in small quantities from time to time or in greater quantities in case of need. When, for some reason, the blood becomes surcharged with sugar, either directly or from these storehouses, excretion takes place through the kidneys and glycosuria is recognized. This process is a complicated one and may be disturbed in a variety of directions. The problem becomes still more involved when it is considered that some or much of the carbohydrate food may be converted into fat, that some may be oxydized to simple products for the purpose of supplying energy, and that some of it may unite with albuminous bodies in building up the proteid tissues (the muscles) as they exist in the body. This latter question of the association of carbohydrate groups with albuminous bodies is one of considerable interest, especially in connection with cases of severe diabetes in which continued excretion of sugar takes place after all carbohydrate food has been withheld and the glycogen of the liver has in all probability been exhausted. Chemists have differed regarding the ability of the proteids to furnish a carbohydrate moiety in their decomposition, and as far as definite proof is concerned the controversy seems to have ended in favor of those who assert that carbohydrates cannot be derived from proteid dissolution. Some recent work, however, indicates that a revision of this conclusion may still be necessary, and in this connection I would refer to the study of Wohlgemuth.¹ He states that the association of albuminous bodies with carbohydrate groups is certainly established, and he has been able to demonstrate this himself. As a result of his investigations he holds that there are proteid bodies with and without carbohydrate groups, and the latter may be of very different sorts. In the case of mucin and mucoids, in the case of ovalbumin and of the glycoproteid of the frog, in the case of casein and of the albumin of the graminaceæ, the hexo group ($C_6H_{12}O_6$) is that which associates itself. In the case of some of these albuminous bodies it has been shown that the carbohydrate group is united with ammonia in the form of amido-hexoses. On the contrary, there are proteids in which the carbohydrate group is a pentose ($C_5H_{10}O_5$). The nucleoproteids of the animal organism belong to this group, as was shown in the case of the nucleoproteids of the pancreas by Salkowsky and of the nucleoproteids of the liver in the present investigation of Wohlgemuth. Among the albuminous bodies

¹ Berlin. klin. Wochenschrift, 1900, No. 34.

associated with carbohydrate the author includes, according to his investigations, casein, vitellin, and gelatin.

Returning now to the question of the carbohydrate disposition, the discussion of Pavy¹ may be cited. He states that three processes account for the disposal of the carbohydrates: Carbohydrate is transformed (1) into fat, (2) into proteid, and (3) into glycogen. If for any reason any one of these processes fails the alimentary form of glycosuria occurs. In the more severe forms of diabetes the tissues are broken down and sugar is derived from this source. While this brief statement of the conditions may be accepted, it does not furnish a clear explanation of the pathogenesis of diabetes and it does not locate the seat of the real difficulty. It does, however, suggest what is growing to be a question of interest, namely, that diabetes is a disorder of carbohydrate metabolism in the broadest sense rather than overproduction or a rapid discharge of sugar in the restricted sense. Some recent observations have shown that the carbohydrates in general suffer, and that, for example, the amount of non-saccharine carbohydrates excreted with the urine may be increased.

H. Rosin and F. Alfthan² found that the normal quantity of non-fermentable carbohydrates in the urine varies from $1\frac{1}{2}$ to 5 grammes of the benzol esters. These benzol esters obtained by the method of Baumann also contain the glucose. In diabetes the amount varied from 9 to above 20 grammes, and was independent of the amount of sugar. The authors suggest that in diabetes there may be times when the fermentable carbohydrates disappear from the urine and the unfermentable may be increased. In a case of diabetes insipidus they found an increase of the unfermentable carbohydrates. This study is one of very great importance and one which well merits confirmation. The fluctuations in the excretion of sugar are well known, and the disappearance of the sugar from the urine is not a rare occurrence. If at such times it could be proved that the non-fermentable carbohydrates are still excreted in excess, a forward step will have been taken in the knowledge of the pathogenesis of the disease. The discovery of such an increase in the case of diabetes insipidus is particularly interesting,³ and is of importance in connection with instances of diabetes mellitus following upon diabetes insipidus. A case of this sort, and it may be said that there are other cases in the literature, has been described by Blackett.⁴ The patient was a man, aged fifty-four years, with no family history of the

¹ British Medical Journal, December 1, 1900.

² Deutsche med. Wochenschrift, August 2, 1900.

³ A case of diabetes insipidus with increase of non-fermentable carbohydrates has been under my care during the last year. A report of this case will be made very shortly by Dr. D. L. Edsall.

⁴ Lancet, November 25, 1899.

disease. He was overworked in 1897 and received a severe shock in 1898. In September of that year he was present at a fire and worked hard to save life. Almost immediately after he began to suffer with thirst, dryness of the mouth, debility, and polyuria. The amount of urine varied from between seven and eight pints to over ten pints and the specific gravity from 1006 to 1010. Repeated examinations showed no albumin or sugar. Early in February, 1899, the amount of urine was much less and the dryness of the mouth and thirst decreased, but on April 22d he had several attacks of vomiting, and the general condition became worse. On the night of April 23d he was partially comatose, and from the 24th the urine was found to be 1026 and contained an abundance of sugar. He died in deep coma on April 25th.

Two other instances of diabetes insipidus may be referred to in this place because of the studies in metabolism. They are not in any other way of interest in the present connection.

Vannini¹ has studied the metabolism in two cases of diabetes insipidus, one being a man, aged forty-seven years, and the other a girl, aged fourteen years. In the one case there was nitrogen retention; in the other case excessive tissue destruction. In the younger case the phosphate excretion was excessive, but in the older patient there was retention of phosphorus. The sensible perspiration was normal in both cases.

The different behavior of different forms of carbohydrate taken as food has often been discussed, though no positive conclusions regarding an altered tolerance for one or another form in diabetes has been reached. Rosenfeld,² in studying the excretion of dextrose, mannose, and galactose in the urine of dogs, found that 50 per cent. or more of the two latter substances was excreted, while only about 20 per cent. of the dextrose was so discharged.

It has been suggested by some that the essential cause of diabetes is an overproduction of sugar, but this has not been proved with any certainty. It would, of course, explain the symptoms of the disease if it could be shown that all of the carbohydrates administered is converted into sugar instead of being used for the production of fat and as energy-giving food. This, however, has not been proved, though in a recent paper Kolisch³ suggests a somewhat similar view. He believes that diabetes is due entirely to excessive production of sugar and that the stimulus of this production comes from proteids. Excessive meat and fat diet is therefore harmful, and in grave cases he believes a purely vegetable diet useful. In many cases he believes the milk diet advisable.

The primary causes which excite disturbances of carbohydrate metab-

¹ Berlin. klin. Wochenschrift, July 16, 1900.

² Centralblatt f. inn. Med., February 17, 1900.

³ Wiener klin. Wochenschrift, December 28, 1899.

olism are no better known than in the past, though influences of various sorts are known to be operative in one way or another. Thus, G. Hoppe-Seyler¹ states that glycosuria is frequent in vagrants, and he attributes this to insufficient nourishment and to exposure with consequent metabolic disturbance. In what way, however, insufficient nourishment and exposure disturb the metabolism remains to be shown.

The influence of the nervous system has been recognized since the memorable experiments of Claude Bernard, but the conclusions that a nervous injury has a direct diabetes provoking power does not seem tenable. It is more likely that circulatory disturbances affecting the liver or other organs are the intermediary result of the nervous injury. This subject of the relation of nervous conditions to diabetes has been fully considered by Dickenson² in his Baillie lectures. Pathologically, much is to be learned regarding the nature of the disease. A certain form associated with disease of the pancreas is well marked but uncommon, while a more frequent variety is associated with nervous diseases. In studying the nervous system he found, in eight out of twenty-two diabetic brains, extravasation of blood in the perivascular canals of the brain, particularly about the deeper arteries. Syringomyelia occurred in two of three cords from diabetics and hyaline change in the lateral parts of the gray matter in three cords. He admits that changes in the nervous system may occur more rapidly after death in diabetic cases than in others, and that the post-mortem findings must therefore be more rigidly scrutinized. He refers to changes in the kidneys as probably the result of the passage of saccharine urine as the cataract of the eye is due to the saccharine blood. The hemorrhages in the brain, however, he believes are casual rather than the results of saccharine blood. He refers to cases of diabetes after injuries of the brain and after head injuries generally; also to the influence of grief, anxieties, and other emotional influences. Further, he refers to secondary nervous conditions such as loss of knee-jerk and peripheral neuritis, and invokes the presence of earthy phosphates in the urine as further indication of cerebral irritation. Finally, glycosuria as a symptom of certain forms of insanity is instanced as a proof of a nervous relationship.

In a clinical way the occurrence of diabetes after shocks and after traumatism is better known than any of the other forms of nervous association. That traumatism may be an operative cause is recognized from such clinical observations of diabetes following injury, and also from the study of the consumption of carbohydrates by individuals who have suffered injuries of various sorts. In a recent study Haedke³

¹ Münch. med. Wochenschrift, April 17, 1900.

² Lancet, February 2, 1901.

³ Deutsche med. Wochenschrift, August 2, 1900.

found in an examination of twenty-five cases of traumatism that alimentary glycosuria occurred in fifteen, or 60 per cent. of the whole number. The effect of anæsthesia could be eliminated, as this in most of the cases was undertaken after the injury. Arterio-sclerosis and alcoholism were also excluded as possible causes. As far as alcoholism is concerned, another series of twenty alcoholic cases showed alimentary glycosuria in but two. He concludes that the traumatism was the immediately active cause. In none of his cases was there permanent glycosuria. More severe injury in susceptible persons might, of course, have led to a confirmed diabetic condition, as was assumed to have been the case in the patient under the observation of Vergely.¹ This was one of diabetes in a woman, aged sixty-eight years, who had suffered a fall on the chest and abdomen. In addition to this there had been a great shock three years before in the loss of her husband. Symptoms of angina pectoris developed some years after the fall and were soon followed by polyuria and great thirst. Sugar was found in considerable quantities and nervous symptoms developed. There was some arterio-sclerosis, but no definite change could be determined in the heart. The author concludes that traumatism often induces diabetes in those having the predisposition.

The attempt to find some infectious or toxic cause of diabetes has never been abandoned by those who have formed the opinion that this mode of origin could explain the pathological features. It is difficult to understand how authors can find in this disease a promising field for investigation in the direction of bacterial etiology, and there is nothing to suggest an origin of this kind, with the exception of occasional instances of apparent transmission of the disease from one individual to another with whom he had been in close association. Notwithstanding this, the search for bacteria continues, and Hammerschlag, in discussing the recent paper by Töpfer,² states that he has isolated from the intestinal contents of diabetics a bacillus which when injected subcutaneously in pure culture produces a marked and persistent glycosuria in animals. Töpfer himself reported the discovery of glycosuria lasting for months in rabbits into whom he had injected the contents of the small intestines of diabetics. The glycosuria so produced was largely controlled by suitable diet. The same results occurred in cats. The characteristic symptoms of diabetes were not seen. It is not impossible that infectious conditions of the gastro-intestinal tract might produce a changed character of the carbohydrate transformation of such a nature that a rapid overcharging of the blood with sugar could occur, but as yet no definite facts have been obtained. The subject is one of speculation only. It

¹ *Revue de Méd.*, January 1, 1901.

² *Verein des Aerztes in Wien*, 1899.

may be interesting, however, in connection with this question, to refer to the investigation of E. Weinland,¹ who states he has found a ferment in the intestines of all the mammalian animals he has examined which he believes is active in converting milk sugar. He believes that this form of sugar is transformed into dextrose or galactose in the intestinal tract. The excess of some ferment capable of rapidly converting starches into dextrose might operate in the way I have indicated above.

Diseases of the circulatory system are not recognized to play a prominent part in the causation or in the pathology of diabetes. Focal changes in the pancreas or altered conditions of the liver might, however, result from such disease and might establish a relationship. Thus, Chiari² records two cases in which there was focal degeneration of the pancreatic substance in which the occurrence of the process *intra vitam* was evidenced by the inflammatory and cicatrizing processes discovered in the foci of disease, though no cause was discovered in these cases. The author inclines to the belief that there is a relation between such areas and arteriosclerotic changes. This seemed apparent in the case of a woman, aged forty-five years, who had suffered with chronic interstitial nephritis, without any symptoms of pancreatic disease. The autopsy showed granular kidney, moderate chronic endarteritis, with decided hypertrophy of the heart. Several pneumonic areas and an enlarged pancreas, with several yellowish-gray, softened areas showing hemorrhagic infiltration. The pancreatic duct was normal. In nearly all of the branches of the pancreatic artery, as in the renal arteries, there was advanced endarteritis proliferans and occasionally more or less occluding thrombi.

Toxic theories in explanation of diabetes have not been wanting, and the question of phloridzin diabetes is not entirely settled, though it is admitted by most investigators that the excretion of sugar after the ingestion of this drug is due to the active participation of the kidneys.

Casper and Richter³ have found that in the case of a diseased kidney the amount of sugar eliminated after administration of phloridzin was much less than in the case of a normal one, and when the disease of the kidney is decided the excretion of sugar almost ceases. They found that the urea excretion and the excretion of sugar will run parallel, though the sugar elimination is a much more delicate test of the integrity of the kidney. This test depends upon the assumed rôle of the kidney in decomposing phloridzin and thus forming sugar. While this result has been obtained by some others, the weight of testimony is in favor of the

¹ Zeitschr. f. Biol., 1899, Band xxxviii.

² Prog. med. Wochenschrift, 1900, xxv., No. 14.

³ Berlin. klin. Wochenschrift, July 16, 1900.

implied rôle of the kidney. A. Seelig¹ discusses the theories that have been suggested for phloridzin diabetes. One ascribes the glycosuria to disease of the kidney, and another explains the excretion of sugar wholly by assuming a decomposition of the phloridzin, with subsequent excretion of sugar to which one of the decomposition products of phloridzin has united itself. The author found, after prolonged use of phloridzin, that there is a necrosis of the epithelium of the kidneys, but he denies the explanation given by some that this is the result of irritation by acetone, since it occurred in rabbits which had excreted no acetone. He believes that the excretion of sugar is a function of the epithelial cells of the renal tubules, and that any excitation of these leads to glycosuria, while their destruction prevents it. He refers to the supposed instances of renal diabetes in man, and especially to the case of Kolisch and Buber, which he does not regard as a genuine example of this condition. As the glycosuria occurred only after taking food, he regards it therefore as an instance of glycosuria due to hyperglycæmia.

The effect of diuretin as recently studied by G. Gobbi² adds interesting confirmation of the above expressed view. He believes this drug has a special action on the renal epithelium, making the escape of sugar casier. When excess of sugar was given simultaneously with the drug the degree of glycosuria was greater than when the glucose alone was administered, and the result was more easily obtained in persons who had hepatic disease or diseases of the kidney than in others. He thinks that the condition may be likened to alimentary glycosuria.

The association of disorders of the liver with diabetes has occupied less attention of late than formerly. Alimentary glycosuria has not been found as frequent in hepatic disorders as was anticipated, and, while diseases of the liver has been found in considerable proportion in diabetes, it is not certain that this association is as important as has been sometimes claimed. Some authors, however, still insist upon the essential importance of the liver and diseases of this organ, and it must be admitted that, in its relation to the formation of glycogen, the significance of hepatic conditions cannot easily be denied.

Pregliatti³ believes that the alimentary glycosuria occurring in animals in whom extirpation of the pancreas has been practised is really due to disturbances of the liver, as he considers that the cœliac plexus is disturbed in the operation and that disorder of the function of the liver results.

Gilbert and Lereboullett,⁴ in discussing two cases of hypertrophic cirrhosis of the liver due to alcohol and associated with diabetes, state

¹ Deutsche med. Wochenschrift, November 1, 1900.

² Il Policlinico, 1900, p. 159.

³ Gaz. degli. Osped. a. delle Clin., 1899, No. 88.

⁴ Gaz. Hebdom. de Méd. et de Chir., May 20, 1900.

that they regard the latter condition as the result of the disease of the liver, since it followed after the latter. In one of their cases the glycosuria disappeared after suitable dieting, but in the other case it increased despite dietary and therapeutic efforts and death in coma finally ensued. The sugar in the meantime persisted without interruption. In another case to which they refer there was a simple hypertrophy of the liver without fatty change or cirrhosis in a case of phthisis. Sugar occurred in the urine in this case and the termination of the case was a fatal one. There was no pancreatic change, and the authors believe the glycosuria the result of the hepatic enlargement and that the latter condition was a form of pure hypertrophy.

The relations of the pancreas to diabetes have been so fully considered in previous numbers of *PROGRESSIVE MEDICINE* that I will not consider the subject at any length. An interesting case from a clinical point of view may, however, be referred to in this place.

E. W. Phillips¹ records a case of pancreatic diabetes due to pancreatic calculus occurring in a man, aged fifty years. There was weakness, emaciation, occasional bloody diarrhœa, and in the intervals fatty diarrhœa, with offensive discharges. There was no thirst or polyuria, but sugar was found in the urine. At the autopsy numerous calculi were found. There was a history of repeated attacks of colic twenty years before. In connection with this case, it may be recalled that pancreatic calculus has several times been recognized before death and confirmed at autopsy.

The character of the stools in cases of pancreatic disease is by no means uniform, as a number of influences may operate to cause changes in the results. Katz² has concluded from his investigations that if 70 per cent. or more of fat in the intestinal dejections is neutral fat this may be taken as evidence of partial or complete loss of pancreatic secretion. The acute diseases of the pancreas disturb the fat-splitting function more than the chronic diseases. The test is not applicable in cases in which there is diarrhœa, since the contents of the intestines are hurried on so rapidly that time is not given for action of the ferments.

Masuyama and Schild³ have studied the treatment of fatty diarrhœa with preparations of pancreas, and report the results in the case of a patient who lost weight and passed about 75 gm. of sugar daily. The intestinal excretions were markedly fatty. In one period of the observation the amount of fat absorption was 36.9 per cent.; in a second period 100 gm. of scraped fresh pancreas were given, and the fat absorption was 63.8 per cent. In a third period the pancreas was administered,

¹ *Lancet*, July 14, 1900.

² *Wiener klin. Wochenschrift*, 1899.

³ *Zeitschr. f. Diät und Physiol. Therap.*, 1899, vol. iii., p. 481.

and the absorption was about the same as before. In the fourth period pancreatic juice obtained by pressure was used, and during this time 45.51 per cent. of fat was absorbed. Fresh pancreatic substance seemed to be decidedly the best remedy to promote absorption of fat, but the patient refused to take it after a time.

Glycolysis in Diabetes. The theory mainly defended by Lepine, that there is in diabetes an excess of sugar because some form of glycolytic ferment is wanting, is at first sight very attractive, though it needs further study. The general subject of glycolysis has been investigated by Biernacki¹ in various conditions, especially diabetes and certain neuroses. He describes the methods for determining the presence of the ferment, and insists upon the recognition of a relative as well as an absolute difference in the action of different amounts of blood upon different quantities of sugar solution. An increase in strength of sugar solution increases the relative and absolute glycolysis, but an increase in the amount of blood may not cause any increase of glycolysis. An alkaline mixture favors the process more than physiological salt solution. In experimental work the conditions should always be the same. He found that defibrinated blood did not act as well as the blood not defibrinated. There is a degree of alkalinity which most favors the ferment's activity, and also a certain concentration of sugar solution most favorable. The determination of these factors is practically impossible, and therefore a comparison of different specimens of blood becomes difficult, if not impossible, unless the alteration from the normal is very manifest. In a series of diabetic cases he found the conversion of sugar to be distinctly reduced, but when the concentration of the sugar solution was increased there was a marked increase in oxidation of the sugar. This shows that it is impossible for the present to speak of reduced glycolytic power with any certainty. It is only possible to say there is some change in the glycolytic activity. The same was true of the functional neuroses.

Some general matters pertaining to etiology might be discussed, such as the influence of race, habits, etc., but I content myself with referring to a discussion of C. von Noorden.² The apparent increase in the number of cases of this disease may, he holds, be due to improved methods of recognition or to an actual increase in the disease. Among the etiological factors chronic alcoholism, heredity, and racial predisposition are usually admitted. The injection of Hebrew blood into the Indo-Germanic races is, he believes, a cause of increased frequency. Referring to the matter of the formation of sugar, he notes that the

¹ Zeitschr. f. klin. Med., Band xli., Hefte 5 und 6.

² Berlin. klin. Wochenschrift, December 3, 1900.

supporters of the theory that it arises from fat are increasing in number. The derivation of oxybutyric acid has come to be regarded by many as from the higher fatty acids. He holds that there is still doubt whether the oxybutyric acid is the cause of coma or a coincidence due to the same cause as that which produced the coma.

Symptoms. But little has been added to the knowledge of the symptomatology of the disease, for the reason that most of the symptoms have been thoroughly investigated before. Some unusual symptoms, however, are frequently overlooked. These are referred to in a recent paper by James B. Herrick.¹ He calls attention to nerve pains in the legs, with loss of patellar reflex and various trophic changes, such as herpes zoster, perforating ulcer, falling of the nails, etc., and the occasional occurrence of peripheral palsies and more serious paralysis; headaches, dizziness, paresis of the external rectus muscle of the eye, changes in the optic nerves, cataract, and other forms of symptoms referring to the nervous system or the special senses may occur. Dilatation of the stomach, vomiting, and diarrhoea are referred to among gastro-intestinal symptoms of importance. In this connection the condition of the urine, apart from its containing sugar, may be discussed. It is too commonly the practice to regard a high specific gravity and excessive secretion as necessary conditions to diabetes; but observers of much experience all agree that instances in which the specific gravity is low and in which polyuria is absent are not rare. In a recent case Larne² found the specific gravity as low as 1002. The same subject is also alluded to by J. B. Herrick.³ He refers to the occurrence of casts and albumin in the urine in cases of diabetes. These may appear in great quantities just before diabetic coma, and may disappear when recovery takes place. He observed this peculiarity in three cases. He further refers to low specific gravity in some cases of diabetes, which may be caused in the development of interstitial nephritis. In one case he found the specific gravity 1004. The lowest recorded specific gravity is 1002.

Among the other uncommon or unimportant symptoms are those referring to the special senses and the skin and mucous membranes. H. Eulenstein⁴ in discussing the conditions of the ear analyzed fifty cases, of which four of his own are described for the first time. All of these were instances of middle-ear disease, and in many cases the cause might have been some intercurrent or accidental condition, such as influenza, colds, etc. In some of the cases, however, the process was evidently purely diabetic.

¹ Journal of the American Medical Association, January 6, 1901.

² Ibid., August 26, 1899.

³ American Journal of the Medical Sciences, July, 1900.

⁴ Deutsche Archiv. f. klin. Med., 1899, vol. lxi.

F. Nagelschmidt¹ notes that psoriasis is not common in diabetes, while diabetes occurs with some frequency in patients who have had psoriasis, and it is of interest to observe that he found alimentary glycosuria to develop after the administration of 100 gm. of glucose in eight out of twenty-five cases of psoriasis. In three of these eight cases he admits that other conditions might have explained the result. In other skin diseases the result was practically negative.

Complications. Among the complications in diabetes various affections of the mucous membranes are observed, and recently Leichtenstern² discusses laryngitis. In one case he saw a distinct furunculosis of the larynx, and he notes among the characters of this condition rapid oedema or abscess formation occurring in different parts of the larynx. After evacuation the abscesses rapidly healed. He believes this condition entirely comparable to the furunculosis of the skin.

Diabetic Coma. The question of coma as a symptom is so closely related with discussions of the formation of acetone and various acids that the two may be referred to together. In a recent report W. Spitzer³ describes an instance of traumatic diabetic coma which occurred in a patient who had had glycosuria for years. This had been easily controllable, and there was never acetone or diacetic acid. After an injury in which he fractured his clavicle and in which he became greatly shocked, the amount of sugar rose at once to 5 per cent., and acetone and diacetic acid appeared. In a few days the patient went into coma, and in ten days after the accident died. The author attributes to the nervous shock some interference with the metabolism of the carbohydrates which leaves the acids of the body unneutralized and thus causes acid intoxication and coma.

It is far from certain, however, that the acids of diabetic acid intoxication are derived from the carbohydrates. On the contrary, the prevailing view makes it seem likely that the fats and the proteids are more largely concerned in the production of the toxic bodies. As far as the formation of acetone is concerned, the opinion has steadily grown that acetone has its origin in the fats of the body and of diet. This opinion is substantiated by the investigations of Waldvogel,⁴ who administered a diet of pure proteids and a carbohydrate diet to fasting persons. In neither case was acetone formed. He concluded from this that acetone is formed out of fats. Further, he found that in starving persons acetonuria could be increased by fats administered by the mouth, but not when they were given subcutaneously. It seemed possible that

¹ Berlin. klin. Wochenschrift, January 8, 1900.

² Münch. med. Wochenschrift, April 17 and 24, 1900.

³ Deutsche med. Wochenschrift, November 22, 1900.

⁴ Centralbl. f. inn. Med., July 15, 1900.

some change must occur in the fats in the gastro-intestinal tract, but the nature of this is still in doubt. On the other hand, Blumenthal and Neuberg,¹ in discussing the question of origin of acetone, concluded that this is by no means settled. Contrary to the older teaching that acetone arises from decomposition of the albumins, there is a tendency of late to ascribe it entirely to decomposition of fats. They draw attention, however, to the fact that casein can produce acetone. From some experimental evidences they further believe that they have demonstrated the possibility of forming acetone from gelatin. Their experiments consisted in the use of iron salts for their catalytic action.

H. G. Geelmuysen² found decided acetonuria in starving dogs after the administration of phloridzin when proteids or carbohydrates were administered, but particularly in the latter case. He could not determine the relation of fats in the food to this condition, but the administration of butyric acid caused a marked increase when this drug was given by the mouth and not when it was administered hypodermically.

F. Voit,³ in discussing the excretion of acetone through the kidneys and lungs of a dog fed with various foods, found a decided increase when the amount of meat was large. The amount of fat or starches did not influence the acetone. Starvation diminished the amount decidedly. The amount of acetone in the expired air was always greater than in the urine, but the entire quantity was not very great.

After all, however, acetone is not the important substance in the acid intoxication of diabetics. B-oxybutyric acid, diacetic acid, fatty acids, and other acid bodies are no doubt the important causes of the clinical symptoms; not any one acid, but the acidosis in general is important. A most interesting study in connection with this acid intoxication has recently been reported by D. Gerhardt and W. Schlesinger.⁴ They have studied the excretion of calcium, ammonium, and magnesium in diabetes. After putting a normal person and a diabetic on a meat and fat diet they found that acetone, diabetic acid, and B-oxybutyric acid appeared in the urine of both patients, and also in themselves when they took the same diet. When bicarbonate of sodium was given in quantities of 20 grammes per day the calcium excretion was much reduced and the ammonium was about parallel, while the calcium and ammonium both increased greatly when the alkali was omitted. In the diabetic subject there was considerable excess in the excretion of calcium over the intake. The use of the alkali caused a retention of nitrogen and prevented tissue waste in the diabetic. The abnormal

¹ Deutsche med. Wochenschrift, January 3, 1901.

² Zeitschr. f. Phys. Chem., Band xxvi., p. 385.

³ Deutsche Archiv. f. klin. Med., 1899, vol. lxvi.

⁴ Archiv. f. Exper. Path. und Pharmacol., vol. xxii., No. 1.

calcium excretion in diabetics they believe is the result of acid intoxication, and it is notable that their investigations showed 67 per cent. of the calcium excretion in the urine, whereas normally only from 10 to 30 per cent. is found in that excretion. There seemed to be a relative retention of magnesium.

Acute Diabetes. A number of cases of acute diabetes have been reported. In most of these the symptoms have come on after some injury or shock. Sometimes, however, such a history was not obtainable.

A. F. McKenzie¹ reports a case of this kind in a young man, aged twenty years. The first symptoms appeared a month before death and the latter being due to coma. Unfortunately, in many of these reported cases no accurate observations of the patient's condition prior to the discovery of the sugar in the urine can be obtained, and this was true of McKenzie's case. It is well known that diabetes frequently remains latent and that the disease is sometimes discovered quite accidentally by insurance examiners, and it is further a matter of common knowledge that the symptoms may become very suddenly aggravated, and thus the disease appears to be acute in onset and clinical course, whereas it has long existed.

E. L. Lees² describes an acute case in a child of five years. The boy had been well until ten days before he came under observation. There were marked symptoms at the first examination, and the next day he was comatose and died before night. The remarks just made regarding the acute onset of the condition apply equally to this case.

Tests for Sugar in the Urine. A number of studies of the various tests for sugar in the urine have recently been published. These may be referred to without much comment, as there is but little that is highly important, for most of the methods now suggested are mere modifications without novelty in other respects.

G. L. Eastes,³ in discussing the phenylhydrazin test for sugar, states that it is useful in cases containing sugar corresponding in amount to a reducing power of five parts per 1000 or less. When albumin is present in quantities sufficient to give more than a cloud it should first be removed by boiling, and Fehling's test then tried. Sometimes he has observed a reaction with Fehling's solution when it was due to the action of a proteid. If the Fehling's solution is positive after removal of the albumin the phenylhydrazin test may be applied and the characteristic crystals observed if there is as much as one part per 1000. If no crystals are found it may be concluded that glucose is absent.

¹ Canadian Practitioner and Review, November, 1899.

² Lancet, December 23, 1899.

³ British Medical Journal, February 23, 1901.

Hall¹ describes a series of experiments designed to determine the best method of applying the phenylhydrazin test. He found that 0.5 grammes of phenylhydrazin with 1.5 grammes of sodium acetate and 5 c.c. of the urine are the most satisfactory quantities when glucose is the form of sugar present. In the case of maltose or lactose as much as 10 c.c. of urine should be used. The reagents should first be dissolved by warming in a few cubic centimetres of water. After the addition of the urine the mixture should be boiled for from three to five minutes, according to the amount of sugar present. The test-tube should then be placed at rest, but need not be put into cold water. Within two to ten minutes the crystals will form.

Riegler² describes a test for sugar which he regards as very sensitive. One c.c. of urine is placed in a test-tube and 0.1 gramme of phenylhydrazin is added and about 0.5 gramme of crystallized sodium acetate, together with 2 c.c. of water. The mixture is heated to the boiling-point and 10 c.c. of a 10 per cent. sodium hydrate solution is added. The test-tube is inverted several times, closing the mouth with the thumb, when if more than 0.1 per cent. of sugar is present the mixture will assume a reddish-violet color. This color should appear within five minutes.

Von Gebbart³ describes a new test for sugar in the urine. A tablet of nitropropiol is dropped into 10 or 15 drops of urine diluted with 10 c.c. of distilled water. The mixture is then warmed. If sugar is present a green and then a blue color is formed, and the reaction has been found in all dextrose containing 0.03 parts per 100 of water. The reaction is not obtained in the urine of the patients taking various drugs, nor is it obtained with biliary pigments, uric acid, albumin, phosphates, or blood.

A. R. Elliot⁴ gives the following method for testing the urine for sugar: A solution containing copper sulphate 27 grains, glycerin 3 drachms, distilled water $2\frac{1}{2}$ drachms, and liquor potassæ sufficient to make 4 ounces is prepared. A second solution consists of distilled water saturated with pure tartaric acid. A drachm of the first solution is heated in a test-tube to the boiling-point, 3 drops of the second solution are added, and the mixture is boiled again. The suspected urine is then added, drop by drop. This method is very similar to one very commonly in use in which failing solution is prepared in separate parts, which are mixed at the time of testing.

¹ British Medical Journal, February 23, 1901.

² Deutsche med. Wochenschrift, January 17, 1900.

³ Münch. med. Wochenschrift, January 1, 1901.

⁴ Kingston Medical Quarterly, January, 1900.

J. A. Grober¹ describes the refractometer of Zeiss. This instrument is introduced into the liquids to determine the refractive coefficient, and the author discusses its value in determining the amount of sugar in the urine. He concludes that it is very useful for this purpose.

The testing of the blood by the methods of Williamson and Bremer is a subject now well known. Neither of these methods, however, is free from the difficulty that extreme care must be taken lest the test miscarry, and beside there is rarely a necessity for depending upon a test of the blood. Occasionally, however, a specimen of urine may not be obtained and an immediate test may be highly desirable. This is illustrated in such a case as has been suggested by R. T. Williamson.² He states that he has obtained the blood reaction for diabetes, which he published some years since, in all of forty-three cases of this disease. He believes it is caused by excess of sugar. The reaction can be obtained after death, and is therefore of value sometimes in the diagnosis of cases of coma when no urine could be obtained.

Prognosis. The results from the treatment of diabetes are satisfactory or unsatisfactory according to the class of cases under consideration. It is well known that certain forms of the disease are essentially curable, while others are as inevitably fatal as carcinoma.

H. Stern³ has studied the mortality from diabetes in New York for the year 1899. The record showed 202 deaths, of which 102 were males and 100 females. There was little difference throughout the seasons of the year. With regard to age, he found that the greatest mortality was between fifty-five and sixty-five, and with regard to nationality the greatest number (57 in all) were Germans, a fact which he attributes to the large number of German Jews; 25 per cent. of the total number were Jews; 60 of the cases died in coma, the youngest subject being fifteen years of age and the oldest above eighty-three. The average age of the coma cases was fifty-eight. The duration of the disease prior to fatal coma was four years, five months in the average, and the duration of the coma itself was in the average forty-four hours. The author admits the more or less unreliable character of deduction based upon statistics of this sort.

Hirschfeld⁴ notes that there is a general agreement that the prognosis in the mild forms of diabetes is generally more favorable than has been believed by the profession. Practical relative recovery is to be expected in cases in which from 80 to 85 per cent. of the carbohydrates ingested in the beginning of the disease are consumed in the body. By relative recovery he means recovery to the point that glycosuria does not follow

¹ Centralbl. f. inn. Med., February 24, 1900.

² Lancet, August 4, 1900.

³ Medical Record, November 17, 1900.

⁴ Berlin. klin. Wochenschrift, 1900, No. 26.

the ingestion of 200 grammes of carbohydrates daily. A lessened assimilation of carbohydrates may be noted after influenza, and after certain colicky attacks due presumably to pancreatic disease. It is especially marked in cases of furuncle and gangrene. An increase in severity of glycosuria is sometimes denoted by increased quantity of urine.

Treatment. The dietetic management of diabetes needs no consideration at the present time, as the subject has been previously discussed and there have been few additions to our knowledge. The fact that certain forms of sugar are disposed of by the diabetic more readily than others suggests a trial of different forms of starches as well. Not only on account of the differences of quantities of starches in different foods, but also on account of possible differences in the rapidity of digestion, etc.

Mosse¹ advises the use of potatoes instead of bread in diabetes, since the amount of sugar is likely to diminish and the general condition of the patient improve under this diet. Practically, the same result was obtained by Saundby,² since there is less carbohydrate in a given bulk of potatoes than in other forms of starchy foods.

A. Berger³ has studied the effect of a pure milk diet on diabetes in seven cases. In but two of these, which were of the milder form of the disease, did the sugar disappear, and the freedom from sugar in these cases was beneficial in the sense that after its continuance for a time other quantities of carbohydrates could be tolerated without the reappearance of the sugar in the urine. All of the cases of severe diabetes treated in this manner showed a continued excretion of large quantities of sugar. The quantity of sugar excreted was three or four times as great as occurred when the diet was one of meat and fats.

Von Jaksch⁴ has studied the effect of arabinose, xylose, and rhamnose in diabetes. None of them, however, can be used as substitutes for glucose in the treatment of the disease.

Sandmeyer⁵ states that the diabetic milk of Rose is free from sugar and contains considerable fat and a small proportion of albumin. He has used it in fifty cases of diabetes, with good results.

Of the drugs that have been used none have been found to possess special power. Occasionally diabetes ceases while a certain drug is being administered, and the reporter records the result as due to the drug, a conclusion which may or may not be shared by others.

Zaudy⁶ describes a case of diabetes in a man, aged fifty years, who

¹ Congress Français de Méd. Interne, 1899.

² Lancet, May, 1900.

³ Wiener klin. Rund., 1900, No. 31.

⁴ Deutsche Archiv. f. klin. Med., August 18, 1899.

⁵ Berlin. klin. Wochenschrift, October 29, 1900.

⁶ Deutsche med. Wochenschrift, August 2, 1900.

seemed to have been entirely cured after an illness of three years. He passed as much as 274 grammes of sugar in twenty-four hours. The quantity of urine had reached 4500 c.c. Acetone, diacetic acid, and B-oxybutyric acid were present. Under dietetic treatment the sugar was reduced, but not very largely. Salol was then administered in large doses (4 grammes per day), and the excretion of sugar ceased in four days and continued absent during the subsequent year. The author very naturally attributes the result to the administration of salol.

G. D. Barney¹ found that the double bromide of gold and arsenic were useful in diabetes. He gave 5 drops three times a day, increasing a drop daily.

The matter of surgical operation in diabetes is one of great interest. The danger of coma has often been insisted upon, but recently there is a movement toward greater laxity in the matter, a tendency which must be justified by more accurate knowledge than is at present at hand.

Gildersleeve,² in discussing the propriety of operations in diabetes, holds that the patient should always be warned of the dangers of the operation, and that no operation should be performed in elderly subjects without urgent reason. In cases of spreading gangrene he advises early amputation far above the gangrene, or waiting, if it seems wise, for a line of demarcation. Dry and comparatively painful gangrene affecting the toes is apt to run its course without serious results.

GOUT.

Etiology and Pathology. The nature of gout is still a matter of active research, mainly on the part of chemists, but as yet no satisfactory explanation of the disease has been reached. Some still hold that uric acid is the active agent in the causation of the disease, but in general this view has been abandoned and may be looked upon as antiquated. Sir Dyce Duckworth,³ however, believes that uric acid is produced in the kidneys and that gout certainly depends upon the increase of uric acid in the blood. The hereditary origin of the disease and the influence of nervous exhaustion are explained by the assumption that there is a strong nervous side to this disease, which, while it may not in itself be sufficient to cause the manifestations, acts in conjunction with the increased production of uric acid. He explains the gouty paroxysms by assuming the periodical occurrence of nervous conditions originating in a cerebral centre. There will, no doubt, be a general concurrence in the opinion that nervous disturbances may bring on gouty paroxysms,

¹ New York Medical Journal, March 31, 1900.

² Journal of the American Medical Association, September 1, 1900.

³ Lancet, August 25, 1900.

acting as the predisposing cause. A difference of opinion, however, will be expressed by most recent investigators regarding the uric acid. Investigations into the amount of uric acid in the urine and blood during and between gouty paroxysms have given rather varied results. Thus W. His, Jr.,¹ found upon investigation in cases of gout that the excretion of uric acid during and between the attacks is practically the same as in healthy persons. At the beginning of an attack the amount of uric acid is reduced, and sometimes it disappears entirely from the urine. The reduction may antedate the attack by three or four days, but it usually occurs on the day previously. The author believes this is due to the deposit of the uric acid about the joints, while the subsequent increased elimination results from the reabsorption of the deposits. He could see no marked results from the use of remedies such as alkalies, vegetable acids, piperazin, and similar drugs. Lithium caused a decrease in the elimination, but colchicum a marked increase. While the author's explanation that the decrease in the elimination of uric acid just previous to the attack is due to a deposit of uric acid is rendered more or less probable by the undoubted fact that deposition of uric acid has occurred at some time, it must not be forgotten that a change in diet and changed conditions of circulation, or even of metabolism due to pain, might explain variations in the excreta.

Contrary to His' results, Badt² found that the uric acid was not lessened in any instance during the attack, but was rather greater, though the increase was very slight. His examinations were made in five cases of gout during and between the attacks. It is certain that in some way, if not as a cause, then, as a result or symptom of the disease, excessive precipitation of uric acid takes place. This subject has recently been investigated by several observers, and these studies have seemed to show a relationship of the uric acid to the local lesions, though not the relationship of an active causal factor.

Freudweiler,³ in a previous communication, showed that the injection of a suspension of acid urate of soda caused lesions of the tissues very similar to those of gout. In a second series of investigations he has undertaken to establish more definitely the relation of uric acid to certain local lesions in animals. He tried to determine whether uric acid is produced *in loco* by injecting into the tissues substances recognized by the antecedents of this compound, namely, hypoxanthin, xanthin, oxalate of ammonium, and glycocoll. In none of these experiments was uric acid formed. In a second series he determined that crystals of uric acid in the tissues do not cause a further deposition of the circu-

¹ Deutsche Archiv. f. klin. Med., September 29, 1900.

² Zeitschrift f. klin. Med., Band xxxvii., Hefte 5 und 6.

³ Deutsche Archiv. f. klin. Med., Band. lxxix., Hefte 1 und 2.

lating uric acid, even when the latter is greatly increased in amount. Neither was there any deposit of uric acid in necrotic tissues, though there was some such deposition in areas of acute inflammation. He concludes regarding the nature of gout that there is in this disease an increase of the uric acid in the fluids of the body, according to the investigations of His, which he accepts. In consequence of this condition there is a tendency to local inflammation, and when a local inflammation coincides with a special increase of the uric acid through dietary or other errors a deposition is likely to occur, and this further increased the amount of local inflammation. The same question has been investigated by His,¹ who found that injections of urate of sodium under the skin of a rabbit caused small nodules surrounded by embryonic fibrous tissue, while the salt injected remained amorphous. Feeding the animals with small amounts of alcohol for a long time caused the surrounding capsule to become well-formed connective tissue and the salt arranged itself in a radiating manner.

A few years ago the theory was published, and quite generally believed, that gout is due to the failure of the final transformation of the purin bases into uric acid and the consequent injury of the kidneys, with increased retention of uric acid and greater retardation in the normal transformation. This view has, however, been abandoned by most investigators, because the method used in the studies which led to this theory has been found an inadequate one, and it must be confessed at the present time that there is no very satisfactory chemical method of determining the alloxure bodies. Recently, W. His, Jr., and W. Hagen² have investigated the occurrence of uric acid of the purin bases in the blood and organs. The authors concluded from a very careful investigation of different methods that there is no method as yet that is reliable for the estimation of the purin bases. Precipitation in cells containing albumoses may cause no deposition or a partial deposition only. The addition of ammonium sulphate may increase the precipitation, but albumoses are then deposited as well. When albumoses are present in small quantities the precipitation is prominent, but some of the albumoses are precipitated at the same time. The preliminary use of ammonium sulphate to deposit albumoses may give good results in the case of excreta, but cannot be used in the case of the extracts of tissues because of the presence of certain other substances. Precipitation with acetate of lead gives variable results, but, under certain circumstances, is the only method that can be employed to obtain the uric acid from extracts of organs. They recommend treatment with baryta and carbonic acid

¹ Deutsche Archiv. f. klin. Med., February 6, 1900.

² Zeitschrift f. Phys. Chem., Band xxx., p. 350.

after first coagulating the albumin with warm 0.5 per cent. sulphuric acid. After the preliminary treatment precipitation as a silver salt is practised.

In a discussion of the question of uric acid formation and retention in its relations to gout, A. C. Croftan¹ states that uric acid is not a product of the oxidation of albumin but of nucleins, and that the chief disturbance in the nuclein metabolism is an increase in the xanthin bases with decrease in the formation of uric acid. This theory, which was originally proposed by Kolisch, has been so widely discredited that it will be difficult for anyone to revive it. Croftan, however, regards the alloxuric bases as very poisonous, and claims to have shown that when injected in 3 to 7 per cent. solutions they produce degeneration of the cells lining the convoluted tubules, as well as proliferation of the endothelium of the intertubular capillaries. After three weeks albumin is regularly found in the urine. The theory of Kolisch was very largely based upon work done with the old Krüger-Wolf method, which is known to give unreliable results. No one has, however, up to the present time attempted to put the theory to experimental test in the way of demonstrating the toxicity of the alloxuric bases, nor have poisonous properties hitherto been claimed or demonstrated for them. The work of Croftan will bear repetition. It does not, however, follow that such demonstrated poisonous properties of the alloxuric bodies would prove a relationship with gout, as it remains to be proved that these bodies are at all increased in this disease.

Practitioners are apt to regard the discovery of uric acid crystals in the urine as significant of a formation of an increase of this substance. They forget, however, that the formation of crystals is very largely dependent upon the quantity and general condition of the urine, and that with a normal excretion of uric acid there may be abundant crystal formation, while, on the contrary, a very large excretion may be unattended with any crystalline deposition. The conditions affecting the formation of crystals is of the utmost importance in cases of uric acid gravel or calculus, and the chemical studies into the matter have, therefore, a large practical interest. Ritter,² in an investigation of the conditions influencing uric acid sediment in the urine, found that mixtures of the monosodic and disodic phosphates with the basic urates and urea caused results of various kinds, according to the quantity of phosphates. Large amounts of the monosodic phosphate caused a deposition of uric acid, while the disodic phosphate prevented such a disposition or lessened the rapidity of its occurrence. When large amounts of the disodic phos-

¹ Journal of the American Medical Association, July 8, 1899.

² Zeitschrift f. Biol., Band xxiv., p. 155.

phate were added an acid sodium urate was deposited. He believes, therefore, that the disodic phosphate is important in the causation of deposits of uric acid. These results are rather at variance with observations made by von Noorden regarding the effect of calcium as the therapeutic agent. Von Noorden found that the calcium, by combining with phosphoric acid in the intestines and thus diminishing the phosphate excretion in the urine and converting the acid into the basic phosphates, reduced the tendency to deposits of uric acid. Tunnicliffe and Rosenheim¹ believe that there is no evidence that quadri-urates occur in the deposits of the urine or in the urate deposits of the body, and would dispense with this term entirely. The supposed quadri-urates are simply mixtures of uric acid and biurates or other uric acid compounds.

Whether uric acid be the active agent in the production of gout or its manifestations, or whether fluctuations in its quantity are but attending conditions, practical experience has proved that diet is of great significance in the etiology. A study of some interest was recently published by H. Kronka,² who has investigated the effect of a meat diet on the production of gout in hens, and found that gout developed in from three to five months, presenting itself in the form of unsteadiness of gait, painful swellings of the legs and joints, and general debility, with paroxysmal increase of the symptoms. In chronic cases he found tophi, while deposits of urates were formed in the kidneys. The amount of uric acid excreted was increased excepting when lime was administered.

This communication is of more or less interest in a general way, but has really no direct bearing on the study of the pathology of gout in man. Interpreted too literally, Kronka's investigations might lead to very erroneous notions.

Symptoms. Little has been added in recent contributions to the symptomatology of gout. There is a general tendency toward extending the limits of the conditions to which the term gouty may be applied, but it is doubtful if many of the affections now described as such are truly of this nature. Obscure conditions affecting the nervous system, the digestive organs, the mucous membranes, and the organs of special sense, particularly the eye, are classified as gouty or lithæmic upon rather slender evidence; but as long as no better classification can be found, and evidence is wanting of a different nature of the maladies, this name will perhaps serve as well as another. It is a little unfortunate, however, that a tendency to use such terms is so firmly rooted, for it often leads to carelessness in clinical observations, conditions being classified as lithæmic whose proper nature might perhaps be recognized

¹ Lancet, June 16, 1900.

² Berlin. klin. Wochenschrift, January 1, 1900.

by more careful investigation. This applies particularly to the cases that have been described as lithæmia of childhood. Jules Conby¹ believes that the symptoms of this are so obscure that the family history must be taken into account in making a diagnosis. He refers to fifteen cases with very diverse clinical histories, and refers in particular to types of the disease in which headaches or sickly vomiting are prominent. The history of gout in the parents may in such cases lead to a proper diagnosis. Hygienic and dietetic measures constitute the treatment recommended.

Gout of the stomach deserves mention in the same connection on account of its obscurity. There are undoubtedly cases of a recurring disturbance of the stomach that cannot be attributed to any other cause, though the lesion supposed to be the result of gout is not discoverable, possibly there is only functional disturbance of the organ.

Grube² discusses these gouty affections of the stomach. Sometimes they may take the form of a moderate nervous dyspepsia, or there may be severe pains, nausea, mucous vomiting, with reduction in the hydrochloric acid of the stomach contents and fermentation. In these cases the tongue is apt to be broad, thick, and presents the appearance of raw beef. It is often fissured, tender, and painful. The stools are also said to be characteristic. Generally there is marked constipation, with decidedly putrefactive fermentation. The appetite of the patient may be good.

Martyn³ refers to the forms of gouty eczema. Of the gouty varieties he distinguishes the dry and the moist form, while of the chronic cases he classifies a latent variety in which various sensations are present but no visible lesion. He advises the use of carbolized ointment or lotions, with regulation of the diet.

J. Dunn⁴ records a case of asthma, with great improvement after administration of colchicum, and he therefore attributes the condition to uric acid.

Diagnosis. The diagnosis of gout in its typical forms rarely offers any difficulty. The irregular and larval forms, however, are most troublesome. The result of the observations of recent years that we believe of importance is the recognition of the fact that arthritis having the clinical characters of articular rheumatism when it occurs for the first time after the age of forty years frequently is gouty in character. The differential diagnosis between ordinary acute rheumatism and gouty articular rheumatism is exceedingly difficult at the age mentioned.

¹ Archives de Méd. des Enfants, January, 1901.

² Verhandl. der Eighteenth Congress f. inn. Med., 1900, p. 189.

³ British Medical Journal, October 13, 1900.

⁴ Virginia Medical Semi-Monthly, September 22, 1899.

A. P. Luff¹ discusses the differential diagnosis of gout, rheumatism, and rheumatoid arthritis, and points out the value of therapeutic agents in establishing the diagnosis. Salicylic preparations may be of value in chronic rheumatism, but of no value in gout or rheumatoid arthritis. The occurrence of exostoses and similar extensive changes in the joints preclude the rapid improvement and the marked fluctuation in gout and rheumatoid arthritis that are frequently observed in chronic rheumatism. As far as gout and arthritis deformans are concerned, the former is more common in men, the latter in women; the former in those of well-nourished habit, the latter in those badly nourished. Increase of diet improves rheumatoid arthritis, while a decreased diet is indicated in gout. The gradual onset without much swelling further distinguishes rheumatoid arthritis from gout, and the frequent involvement of the temporomaxillary joint, which is never involved in gout, and the decided symmetry of the disease are further indications of rheumatoid arthritis. The author denies the nervous origin of this disease and regards it as infectious. He points out that rheumatism may predispose to arthritis deformans, and also that gout may be associated with it—two observations of considerable practical interest.

Strumme² reports a case of fatal gout in which the symptoms were finally those of nephritis, with slight swelling of the lymphatic glands and severe cachexia. The chief interest in the pathological examination was the presence of wide-spread amyloid degeneration.

Strümpell³ discusses the diagnosis of gout. He believes the disease is more common than has been supposed in Bavaria. The attack may begin as a typical podagra, but other joints are not infrequently first involved. When several attacks occur the lower extremities are most frequently affected. The disease is usually confined to one joint at a time, and the repetition of the attacks is more or less characteristic. The duration of the attacks is shorter than in rheumatism. The elimination of uric acid in the urine is of no diagnostic or real importance, and the gastro-intestinal symptoms he believes have been overestimated. Among the forms of larval gout he discusses chronic arthritis, different painful affections, such as tarsalgia, achillodynia, etc., gouty kidney, cardiovascular conditions, obesity, and affections of the skin and mucous membrane.

Treatment. The treatment of gout is a matter of constant interest and of great importance. Various remedies have been lauded, and their supposed efficacy has been based upon their ability to dissolve uric acid either in the body or in vitro. The fallacy of this line of reasoning

¹ Edinburgh Medical Journal, 1900, p. 230.

² Deutsche Archiv. f. klin. Med., Band lxiv.

³ Münchener med. Wochenschrift, September 11, 1900.

is pointed out by Klemperer,¹ who discusses the medicinal treatment of gout. He states that the search for a remedy to dissolve uric acid and prevent the formation of uric acid is a mistaken proceeding. An increase of uric acid is, after all, a matter of secondary consideration, the impossibility of which has been very much exaggerated. In many conditions in which there is known to be increase of uric acid in the blood there is an absence of gouty symptoms. The important matter in the local lesions of gout is the first occurrence of inflammatory and necrotic areas caused by some unknown poison. The deposit of uric acid is secondary. The original necroses, he believes, are the result of some poison of unknown character, and he suggests that it would be rational to attempt the excretion of this through work, sweating, baths, water-cures, diuretics, etc.

Various contributions regarding remedies that are supposed to be valuable for the solution of uric acid have been made, and reference might be made to the following :

Nicolaier² has found that the development of micro-organisms in the urine is inhibited by urotropin only when the urine is kept at body temperature. If at this temperature formaldehyde results from the decomposition of the urotropin the presence of acids, including uric acid, aids in this decomposition. He finds further that urotropin is a useful solvent of uric acid, and he has found it valuable in the treatment of uric acid gravel.

Brockman³ has also found urotropin a useful solvent of uric acid stones.

Of a similar nature is the recommendation of Hermann,⁴ who has found glycerin a useful remedy for uric acid calculi. There was relief or discharge of the stones in 60 per cent. of 115 cases. The quantity administered was from 1 to 4 ounces, dissolved in an equal amount of water and given between meals, repeating the remedy for several days. Headache occasionally occurred and diarrhoea developed in three cases, but soon disappeared. Albuminuria was not increased. The author suggests that the glycerin acts purely as a lubricant.

E. L. McGinnis⁵ has found cataphoresis useful in two cases in which gouty tophi occurred. The joints were covered with absorbent cotton saturated with iodide of lithium, and the galvanic current was then applied.

The only plan of treatment that offers any hope of useful result at the present time is dietetic treatment. I have become convinced that, as in the diseases of the stomach, useful results are often obtained by a

¹ *Therap. der Gegenw.*, N. F. ii., 1900.

² *Zeitschrift f. klin. Med.*, Band xxxviii., Hefte 4, 5, und 6.

³ *Lancet*, June 30, 1900.

⁴ *Medical Chronicle*, January, 1900.

⁵ *New York Medical Journal*, April 7, 1900.

form of diet which might not seem to be especially adapted to the disease, but which has been greatly restricted in amount. The results are due to the restriction rather than to the character of the diet. Undoubtedly, however, restriction and change of character of diet is advisable.

E. P. Adams¹ advocates an almost exclusive dietetic plan of treatment for gout. He believes there is an excess of urates in dieted diathesis, and that these are increased by the use of nitrogenous foods, by alcohol, as well as by exhaustion, lack of muscular exercise, cold, and other conditions. He advises the drinking of abundance of water so as to flush the system, and permits coffee for its diuretic effect, but excludes the latter if it induces any diuresis. Milk is exceedingly valuable. Common salt must be used in limited quantities, as it tends to form sodium biurate. He advises various starchy vegetables, fruits, fats, and sugars.

RHEUMATOID ARTHRITIS.

Nothing has been added during the year to our knowledge of the nature of this interesting condition. The tendency manifested during the last few years toward the acceptance of an infectious nature for this disease has not been stimulated by any very notable demonstration. The theory of the nervous origin or association of the condition, on the other hand, has been more clearly established. A case of some interest in this connection was reported by Preble and Hektoen.² In this there were associated multiple fibromata of the nerves. The patient was a woman, aged thirty-five years. The disease began when the patient had reached young womanhood, and had first caused general weakness and pain, which gradually increased until she was totally disabled. She gave a history of complete paraplegia, without vesical or rectal symptoms, but Preble believed this of hysterical character. Slow affection of the joints began subsequent to the appearance of the tumors, which afterward became prominent. The joints were swollen and deformed, but there was not much pain, and the affection began in the small joints of the hand symmetrically. The first tumor appeared on the forehead when the patient was very young. Shortly after this other tumors appeared irregularly and in great numbers over the entire body. One of the tumors on the forehead was removed by an operation and another on the thigh ulcerated, but the ulcerated area never healed. She was small and deformed, intelligent, but very irritable. There were numerous tumors arranged irregularly or in tortuous strings. They were not painful or tender. The forehead, face, the neck, body and limbs were

¹ Journal of the American Medical Association, December 23, 1899.

² American Journal of the Medical Sciences, January, 1901.

involved, the masses varying in size from that of a bean to a small body the size of a pinhead. Some were sessile and pedunculated. More deeply there were fusiform and ovoid tumors, not attached to the skin, as a rule. There was characteristic deformity of the hands. There were no organic lesions, no change in the blood excepting a moderate anæmia, and no changes in the nervous system. The spine was deformed, and this later increased greatly. Death occurred without any apparent cause. The autopsy showed numerous tumors of the skin, disorganization of various joints, and tumors along the course of the various nerves. The phrenic nerve was occupied by several small, cylindrical enlargements. The retroperitoneal nerves, the sciatics, and other cerebro-spinal nerves were involved, and there were tumors within the spinal cord. The details regarding the nervous pathology are specially interesting from the neurological aspect. The changes in the joints were characteristic. The affection of the nerves in this case may have been purely a coincidence; but, on the other hand, it is not impossible that some more direct connection existed between the condition of the nerves and the joints.

Various rheumatic conditions of the spinal column have been described during the last several years, and the discussion of the subject is one of particular interest. It cannot be asserted that all of the cases are of this type. This was brought out very clearly by Dana,¹ who discussed stiffness of the spinal column in general, and especially chronic spondylitis. Aside from the more frequent forms of stiffness of the spine and Pott's disease, the condition is met with in association with chronic rheumatism, rheumatoid arthritis, or as an occupation kyphosis. He refers to the two types of chronic spondylitis recently discussed—that first discovered by Bechterew, in 1892, and the second type described by Strümpell and Marie. In the first type there is stiffness of the vertebral column, with kyphosis, the disease beginning primarily in the spine. There is usually much intercostal pain, and the hips and shoulder joints are little if at all involved. Heredity and traumatism seem to figure in the etiology, according to Marie. In the second type, which has been designated as rhizomelic spondylitis on account of the involvement of the spine and the shoulder joints, there is progressive ankylosis involving the hip joints first and then the vertebral column and shoulder joints. The knees may be involved, but the smaller joints are never implicated. The process is chronic and in association with rheumatism or gout, and accompanied by very little pain. The author refers to two cases belonging to the type of Bechterew and one of the second variety. In the diagnosis he suggests that one must differentiate between spondy-

¹ Medical News, November 25, 1899.

litis, rhizomelia, and arthritis deformans involving the vertebral column. The essential points in spondylitis are, first, the production of ankylosis without previous inflammation and without a preliminary deformity; second, the origin in the vertebral joints, and the secondary involvement of the hips and other large joints; third, the fact that the small joints are very rarely affected, that the internal organs and nervous system are normal, and that there is no previous history of rheumatism or gout and no evidences of rheumatoid arthritis in other parts of the body. There are undoubtedly numerous cases in which the vertebral stiffness is a consequence of occupational posture, with perhaps slow inflammatory changes in the intervertebral joints, and in other cases the condition follows acute rheumatic inflammation, as in the case described by L. R. Müller.¹ This occurred in a man, aged twenty-eight years, following acute inflammatory rheumatism. The spine became rigid and there was some backward curvature below and retraction of the head. The hip joints were decidedly involved. Some instances of a similar nature have come under my own observation.

The pathology of the forms of spinal disease under consideration has received comparatively little attention, as the opportunities for examination have not been very frequent. This side of the question is discussed to some extent, as is also the identity and independence of the condition, by H. Senator.² He reports a case of spondylitis in a man, aged sixty-five years, who had a history of rheumatism and afterward developed stiffness and kyphosis. He denies the claim of Marie that this is a new or hitherto undescribed disease, and he points out that there are two varieties of spondylitis deformans, in one of which the disease originates laterally about the transverse processes and ligaments and is associated with bony outgrowths, while in the other the process originates in the intervertebral cartilages. The nervous symptoms are caused by the involvement of the nerve-roots or are independent of the spinal deformity, but dependent upon underlying gouty or rheumatic affection.

It has frequently been asserted that the involvement of the spinal column is not usually attended with affection of the smaller joints. There are, however, many exceptions to this rule, though it is possible that the more pronounced forms of spondylitis, such as those described by Marie, are associated with involvement only of the hip and shoulders, leaving the smaller joints unaffected. A case of stiffness of the spine associated with involvement of the small joints is reported by Kuhn.³ He reviews the literature of ankylosis of the spinal column, and reports a case in a girl, aged twelve years, with rheumatic family

¹ Münchener med. Wochenschrift, October 10, 1899.

² Berlin. klin. Wochenschrift, November 20, 1899.

³ Münchener med. Wochenschrift, September 25, 1900.

history, in which pains began in the ankles at the age of eight years and later involved the knees and hands, the spine, and hips. The author regarded the case as one of arthritis deformans of atypical character. The involvement of some of the small joints distinguishes this case from typical rhizomelic spondylosis.

Another instance of the same sort is that of H. A. Elliot.¹ This was an extreme case of rheumatoid arthritis which began at the age of twenty-one years, and it had lasted thirteen years at the time of the report. The patient was almost completely helpless, as practically every joint was ankylosed, the spine being rigid and the hips and small joints all being involved. Several teeth had been removed in order that he might swallow food.

Nothing has been added to the treatment of rheumatoid arthritis. I have before recorded instances of beneficial effects of various plans of treatment, such as the use of hot air, massage, etc., and have referred to satisfactory improvements in my own experience. The matter of the hot-air treatment is referred to by Bier,² who believes that the good effects of hot-air treatment of joints in rheumatoid arthritis is caused by the hyperæmia induced.

ADDISON'S DISEASE.

Etiology. No special causes for the localization of tuberculosis or other pathological processes in the suprarenal glands have been discovered. It is not impossible that some form of local predisposition exists, but if this be the case no definite proofs of it have as yet been found. Fleming and Miller,³ however, record the occurrence of a condition simulating Addison's disease in several members of a family. The first member affected was the mother of the family, and subsequently four children, aged seven, five, three and a half, and two and a half years, had similar symptoms, including pigmentation, gastro-intestinal disorders, and great weakness. The pigmentation was decided and took the form especially of mole-like spots. The authors do not positively regard the cases as Addison's disease, but believe the similarity at least highly suggestive.

Pathology. The nature of the disease of the suprarenal capsule associated with Addison's disease may vary widely, as is well known, and the symptoms may or may not occur in cases in which the lesions are apparently the same. The unknown quantity in the pathogenesis

¹ Medical Record, November 17, 1900.

² Münchener med. Wochenschrift, November 28 and December 5, 1899.

³ British Medical Journal, April 28, 1900.

is the exact conditions that disturb the functional activity of the gland, for this latter is undoubtedly the immediate cause of the pathological manifestations. C. Philips¹ reports an instance of Addison's disease following simple atrophy of the suprarenal glands, and calls attention to the rarity of this pathological finding. Pigmentation of the skin began fourteen years before the severe symptoms. The author has collected thirteen previously reported cases in which there was simple atrophy of the glands. He believes that in his case the general condition resulted from perverted action of the gland rather than from a quantitative decrease of action. Such a view may be correct, though experimental as well as pathological evidence would seem to demonstrate that the disturbance of action is more often quantitative than qualitative. This may be stated in spite of the numerous reported instances of pathological transformations of the glands, in which every vestige of suprarenal tissue seems to have been destroyed. It is only necessary in this connection to refer to the cases of cystic condition of the kidneys in which no trace of renal tissues could be found and in which the functional activity of the organ has nevertheless been maintained.

An instance of extensive disease without symptoms has been recorded by Carriere and Delearde.² They describe a case of bilateral tumor of the suprarenal capsules in a man, aged fifty-four years. The mass on each side grew about the upper end of the kidney. The right kidney, with the attached tumor, weighed 940 grammes, and the left kidney, with its tumor, 1250 grammes. The kidneys themselves were a little diseased. The tumors on the two sides were of the same structure and are described as epithelial carcinomata, with numerous hemorrhages. There was no evidence of Addison's disease.

Similarly, Rona³ reports five cases of syphilitic and tuberculous disease of the suprarenal bodies, in none of which were the symptoms of Addison's disease observed. His explanation for this is the partial involvement of the gland or the recent occurrence of the disease. As proof of the latter explanation cases might be cited in which the suprarenal disease had undoubtedly existed for some time before the symptoms of Addison's disease developed or in which these symptoms never became fully developed. An instance of this sort has been published by J. M. Finny.⁴ In this case there was malignant disease of the lungs and of the suprarenals. The latter proved to be the primary seat. There was pigmentation of the skin of the face, causing a dusky complexion, but no other signs of Addison's disease.

¹ *Journal of Experimental Medicine*, September, 1899.

² *Archives de Experiment*, xii., 1900.

³ *Ungar. med. Presse*, iv., 1899.

⁴ *Dublin Medical Journal of the Medical Sciences*, November 1, 1899.

The nature of the pigmentation of Addison's disease has not been fully determined. A study of the subject has been made by Pforringer¹ in connection with a case in a young woman, aged twenty-four years. The symptoms began early in 1898, with darkening of the skin, after which violent headaches, gastric and intestinal symptoms, vomiting and emaciation and great weakness developed. Death occurred in coma about a year after the onset. There was caseation and enlargement of the suprarenal gland on both sides. The author studied the question of the formation of the dermopigment in connection with this case. His investigation confirmed the view that the pigment is hæmatogenous in origin because of the situation of the pigment in relation with the bloodvessels, its color, etc., but he could not find any proof of the claim of Riehl that there are small hemorrhages from the thrombosed vessels of the skin. On the contrary, he believes that such lesions are secondary and not the primary cause of the pigmentation. In a few instances he was able to observe direct escape of pigment from the bloodvessels. There were either free pigment granules or granules enclosed in leucocytes. The formation of the pigment in the blood is still a matter of uncertainty.

Symptoms. The clinical course of the disease is very uncertain, and the diagnosis in larval cases may be impossible. This may account for some of the instances of acute character, though there are cases in which the course is unquestionably acute. Trevithick² describes a case of this sort, the symptoms lasting but two months. Suprarenal extract, which was given late in the disease, had no effect. The autopsy showed tuberculosis of various organs, but none of the suprarenal bodies. These were fibrous in character.

Charles G. Willson³ reports a case of Addison's disease in a young woman, aged twenty-four years, who gave a history of sudden vomiting and diarrhoea beginning four days before admission to the hospital. Her temperature was 97° F., the pulse rapid and feeble. No other symptoms or physical signs could be discovered. Her skin was rather dark, but she believed this had always been so. She was a native of Germany, and gave no history of previous illness. The patient died after some days, and at the autopsy both suprarenal bodies were found enlarged, hard, and irregular in outline. The gland structure was replaced by cheesy masses, and there were small, cheesy lymphatic glands in the vicinity. Tubercle bacilli were demonstrated in the caseous glands. The adjacent semilunar plexus and the sympathetic nerves were found surrounded in dense fibrous tissue.

¹ *Centralbl. f. Allg. Path. und Path. Anat.*, xi., 1900.

² *Lancet*, July 14, 1900.

³ *Medicine*, February, 1901.

Diagnosis. The tuberculous nature of the suprarenal disease can, as a rule, be guessed at by reason of the frequency of this lesion, but cannot usually be positively determined. The report of W. F. Cheney¹ is therefore most interesting. He found a marked tuberculin reaction in a case of Addison's disease in which there was no evidence of tuberculosis in any other part of the body than the supposed involvement of the suprarenal. Autopsy showed marked enlargement and caseation of both glands, with secondary involvement of the liver and a healed tuberculosis of the left lung.

The uncertainty of the diagnosis in larval cases, to which reference has been made, is well shown in a case of H. W. Evans,² who observed symptoms suggestive of Addison's disease in a girl who, during the fifth week of typhoid fever, began to vomit, suffered with marked rapidity of the pulse, and developed pigmentation of the skin of the abdomen. The patient died of asthenia in the thirteenth week of the disease. The occurrence of pigmentation in various abdominal diseases is well known. The diagnosis of Addison's disease cannot be made on this ground alone, and when there is sufficient reason for other symptoms, such as vomiting and circulatory weakness, the diagnosis may be unjustified even in the case of a more complete clinical picture than that afforded by pigmentation alone.

The characters of the pigmentation of the skin and mucous membranes are now recognized as being far more variable than was formerly believed. A rather unusual type is described by Buzzard.³ The general surface was darkly pigmented, but on the face, knees, abdomen, and palms of the hands and fingers there were white patches surrounded by deeply pigmented skin. At the autopsy there was found tuberculosis of the lungs, peritoneum, and other abdominal organs, including the suprarenal capsules, which were nearly destroyed.

Ménétrier and Oppenheim⁴ record a case of gradual evolution of symptoms of Addison's disease in which death occurred from a throat affection caused by the pneumococcus. Both suprarenal glands were involved.

¹ Philadelphia Medical Journal, March 24, 1900.

³ Ibid., February 17, 1900.

² Lancet, June 9, 1900.

⁴ Gaz. des Hôp., March 30, 1900.

OPHTHALMOLOGY.

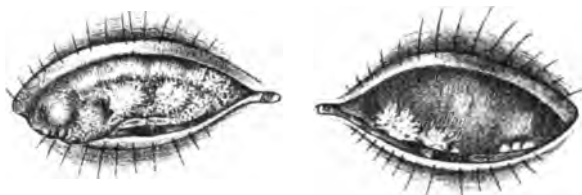
By EDWARD JACKSON, M.D.

DISEASES OF THE CONJUNCTIVA.

Conjunctivitis. In the literature referring to inflammation of the conjunctiva the most striking contributions of the year 1900 deal with a form of disease hitherto unrecognized. It must be a rare condition; but the thorough studies that have been made of it are interesting from the stand-point of general pathology as well as from that of ophthalmology.

CONJUNCTIVITIS PETRIFICANS. At the Heidelberg Ophthalmological Congress in 1895, T. Leber proposed this term to designate a condition of which he then described a single instance. Since that time no similar case has been recorded until June of the past year, when Ernst Reif¹ reported the case represented in Fig. 76. Four months later Pro-

FIG. 76.



fessor Leber² reported a complete résumé of earlier accounts of peculiar cases of probably the same character, with a very thorough clinical, microchemical, histological, and bacteriological study of the disease as manifested in a series of three undoubted cases and three others of probably the same character.

The most typical cases have been presented in women of from sixteen to thirty-eight years of age; but cases of probably the same essential character have been observed in both sexes and at ages ranging from one to forty-six years.

The conjunctiva does not participate as a whole in the process, but isolated points or areas of disease appear, and later other parts become affected, while those first involved may become partly or entirely healed. The characteristic appearance is of white, opaque, calcareous

¹ Graefe's Archiv für Ophthalmologie, Bd. l., Abt. 1.

² Ibid., Bd. li., Heft 1.

spots projecting but little above the normal level and each surrounded by a zone of reddened and swollen conjunctiva. The white spots are at first small and rounded, but as they extend they become irregular or radiating in shape. The lower part of the ocular conjunctiva is a common locality to be first affected. Sometimes a lesion on one conjunctival surface will seem to give rise to a spot in the portion of the conjunctiva that habitually lies in contact with it, as by an infection. Sometimes the disease is confined to one eye. In other cases the second eye may be attacked after the first has recovered, or both may be involved at the same time.

The inflammatory reaction is not very severe, and in most cases there has been a good recovery ; but the cornea may be affected by the lid changes, and in a few cases the eye has been lost. The individual lesions often run rather an acute course, but the appearance of new centres of disease may continue the case for months or years.

The involved surface loses its epithelium and becomes somewhat roughened. It gives rise to no secretion, but may be covered by the secretions from other parts of the conjunctiva. The general appearance of the eye may be strikingly similar to that produced by a burn with some caustic. Beside loss of the eye through disease of the cornea, symblepharon has been observed as a result ; but no displacement of the lid margin has been noted and there is no marked tendency to contraction of the conjunctival sac. The conditions found on microscopical examination differ radically from those of ordinary calcification or ossification of tissue.

The chalk-like deposit consists of calcium carbonate and phosphate, and of crystals which appear to be those of an organic compound of calcium. These latter are soluble in alkalis as well as in mineral acids.

Sections through the affected conjunctiva exhibit a superficial layer containing the deposit of calcium salts, and sharply separated from this by a line parallel to the surface a deeper layer free from any such mineral deposit, but markedly infiltrated. In the deeper parts of the petrified layer, and in the infiltrated area below it, the bloodvessels appear to be filled with a hyaline substance which stains like the petrified tissue. Its staining is somewhat similar to that of amyloid material. In the hyaloid thrombi of the vessels are found red blood-corpuscles. In the deeper or non-petrified layer an abundance of eosinophile cells are found.

The results of bacteriological investigation have been negative ; but Leber is confident, from their character, that the lesions arise by infection. He believes that a chemical poison generated on the surface extends inward and affects the walls and contents of the smaller vessels, finally producing a tissue necrosis with the calcium deposits. The deposit might be due to the absence of free carbonic acid that ensues when

tissue respiration ceases and to evaporation from the free surface of the membrane. But to account for the sharpness and regularity of the limit of petrification, Leher supposes this to be fixed by the meeting at this level of currents carrying different chemical compounds.

Though the disease seems to be parasitic, the danger of infection must be slight, for in no case was the contagion traced from one person to another, although the patients were all subject to the usual contacts of daily life. Treatment has so far been of comparatively little service. Moist warm dressings were sometimes useful in removing the necrosed tissue. Mechanical removal, especially excision of the whole diseased area, seems to be of greatest service. By such removal relapses and subsequent new invasions are prevented or rendered less severe. Antiseptics proved of little value.

PURULENT CONJUNCTIVITIS. The common dependence of this disease upon the presence and growth of the gonococcus in the conjunctiva is universally accepted. In ophthalmia neonatorum N. Guerola¹ found it in all his twenty-five cases, though sometimes in company with other bacteria. But there are new illustrations of the fact that cases of purulent conjunctivitis do not all originate thus. Nedden² reports a case which was clinically one of ophthalmia neonatorum. The disease had begun immediately after birth, and when seen on the tenth day it presented a typical picture of purulent ophthalmia. A thorough bacteriological examination, however, proved the causative organism to be not the gonococcus, but a bacillus which was identified as a pseudo-influenza bacillus, one that has been found causing purulent inflammation of the middle ear in infants. The usual treatment for ophthalmia in the newborn in this case brought about a slow cure. P. Hagland,³ in the case of an older child (five months), found the disease to be caused by the diplococcus intracellularis meningitidis of Weichselbaum-Jäger. In this case perforation of the cornea occurred in spite of treatment, and it terminated in shrinking of the globe.

On the other hand, the connection of gonorrhœa with forms of conjunctival disease that would not be classed as purulent ophthalmia is being noted. I last year⁴ called attention to Fournier's observations in this direction. Under the title "Metastatic Blennorrhagic Conjunctivitis," Fage⁵ calls attention to the class of cases in which patients suffering from gonorrhœa exhibit the usual symptoms of commencing purulent conjunctivitis, but in which the disease stops short without purulent

¹ *Annales de Oftalmologia*, November, 1900.

² *Klinische Monatsblätter für Augenheilkunde*, March, 1900.

³ Supplement to *Klin. Monatsbl. f. Augenheilk.*, 1900.

⁴ *PROGRESSIVE MEDICINE*, June, 1900, p. 320.

⁵ *Recueil d'Ophthalmologie*, April, 1900.

discharge, and in which the gonococcus is not found in the conjunctiva. These cases he regards as due to the action of the toxins which reach the conjunctiva through the general circulation. His explanation seems plausible, but it must be borne in mind that in the other manifestations of gonorrhœa which are regarded as metastatic the presence of the gonococcus has been demonstrated by various observers.

H. McL. Morton¹ reports a case in which repeated attacks of the metastatic character occurred in connection with chronic urethritis, but he has also seen cases in which he thought the probability of infection carried to the conjunctival sac by external means was very slight. He therefore thinks that the bacteria may sometimes reach the conjunctiva through the circulation.

The treatment of purulent conjunctivitis continues to receive special attention, both on account of its intrinsic importance and because of the wide trial of the new silver compounds. To estimate the value of the newer methods the value of all the older methods must be carefully considered. There is evident a growing recognition of the importance of thorough and frequent cleansing of the conjunctiva. This is to be done not three or four times a day, but, where possible, every hour or half-hour when it will not too much interfere with the child's sleep. Of course, for such frequent cleansings means must be adopted that will be free from the danger of mechanical injury to the cornea, and only such solutions can be employed as are quite non-irritant. Wolfberg² employs a solution of boric acid to which has been added formalin in such small quantity as not to cause pain. He also, in protecting the sound eye, uses a piece of lint fastened to the face with collodion, which excludes this eye from vision and compels the patient to open the affected eye in order to see. This must encourage movements of the affected eye that will aid materially in freeing it from discharge, and in many cases should thus prove an efficient help in the cleansing.

But when the swelling becomes so great that it is impossible to open the eye at all other mechanical means must be resorted to. The gentle manipulation of the lids will do much to bring masses of discharge up from the depths of the conjunctiva. When necessary, the division of the outer canthus or of the upper lid must be practised to permit free access to the conjunctiva. Such an operation to render possible the thorough treatment of the inflamed mucous membrane I am sure might be more frequently resorted to with benefit.

The Value of Protargol. This has been so widely discussed, and the united experience of the profession with the drug during the past year

¹ Ophthalmic Record, June, 1900.

² Wochenschr. f. Therapie u. Hygiene des Auges, June 14, 1900.

has been so large that it seems not premature to attempt at this time some estimate of its comparative value in the treatment of purulent inflammation of the conjunctiva.

A. Alt,¹ from a daily use of the drug for over two years, concludes "that it is a most useful agent and can in most cases take the place of nitrate of silver." In gonorrhœal conjunctivitis of the new-born he has used it with "perfect satisfaction." The cases did well and the duration of the disease was surely no longer than with silver nitrate. In the gonorrhœal conjunctivitis of adults his experience was the same. S. Stephenson² claims that for gonorrhœal conjunctivitis of all kinds the results with protargol are better than with any other salt of silver. F. C. Hotz³ states that clinical experience has not only proved protargol to be as efficient as silver nitrate, but has discovered in it valuable properties the nitrate does not possess. He refers to the fact that, being free from the dangers that limit the use of the nitrate, protargol can be used more freely and thus more efficiently. But perhaps the most striking testimony in favor of protargol is furnished by N. Guerola,⁴ who in twelve cases of ophthalmia neonatorum treated one eye with silver nitrate and the other with protargol. The average time required for complete cure was for the nitrate nineteen and three-quarter days; for protargol nine and seven-twelfths days.

In the discussion of Dr. Hotz's paper before the American Medical Association, G. E. de Schweinitz stated he had been impressed with the uncertainty of protargol, and except that it was far more agreeable, he ranked it below silver nitrate. Of others taking part in the discussion, Wood, Clark, and Allport agreed substantially with de Schweinitz; Fox, Southard, Connor, Bulson, and Hiers indorsed, in the main, the estimate of Hotz. C. A. Veasey,⁵ from a review of the literature, finds the results so contradictory that it is impossible to make a definite estimate of the drug; but his review includes reports upon many therapeutic applications of protargol other than the one now under consideration.

Some of the uncertainties as to its value may have arisen from its inefficient use. Unless the doctor makes the application himself, or has it made by a specially trained assistant, he cannot be sure that it has had a fair trial. It should be borne in mind also that considerable experience is required to use any drug to the best advantage. In this regard protargol is seriously handicapped when it comes to dispute the

¹ American Journal of Ophthalmology, February, 1900.

² Edinburgh Medical Journal, March, 1900.

³ Journal of American Medical Association, August 25, 1900.

⁴ Annales de Ophthalmologie, November, 1900.

⁵ Ophthalmic Record, December, 1900.

previously acknowledged supremacy of silver nitrate in purulent conjunctivitis. It seems certain that to prove effective, protargol must be applied far more frequently and freely than silver nitrate. If the main dependence must be placed on a single application daily by the physician, the nitrate is decidedly the better drug to use. The slight preference which I have still felt for the nitrate, as a final dependence in this condition, rests on the larger experience I have had with it, not that it has been a more favorable experience. I would advise one who has had little experience with either remedy in this disease to use the less irritant protargol. Some writers would go further than this. A. Lamhofer,¹ without any question of a substitute, rejects silver nitrate from the treatment of purulent conjunctivitis, getting better results from less irritating methods, especially thorough cleansing.

In using protargol all who have been most pleased with it (except Alt, who uses a 3 per cent. solution) have found it more efficient in strong solutions. The application made to the everted lids should be of solutions of from 15 to 50 per cent. strength, while for cleansing the eye 2 to 10 per cent. solutions may be employed. Hotz points out that in making applications of the stronger solutions their thorough contact with the affected tissue is essential. He uses a well saturated cotton swab and rubs it firmly over the affected surface. The significance of the mere strength of a solution is comparatively slight, apart from the manner in which it is used. Even the strongest solutions should, at the height of the disease, be applied two or more times a day. With the weaker cleansing solutions the mucous membrane will be to some extent continuously subjected to the action of the drug.

All observers fully agree that protargol is much less irritant than silver nitrate. The weaker solutions are for most eyes practically non-irritant, ranking in this respect with boric acid or physiological salt solutions. But a few individuals exhibit an idiosyncrasy toward the drug which renders it almost inapplicable to their cases. In the discussion above referred to I reported a case in which the 5 per cent. solution caused more complaint than the passage of a large Theobald probe through the lachrymal passages, and in which the irritation continued to the second day. Allport, too, had met with a similar case, but such cases must be very rare. The only other unfavorable effect of protargol is staining of the conjunctiva from prolonged use of the drug. E. Pergens² reports a case in which the conjunctiva became stained a marked yellowish-brown. The discoloration was deepest upon the lids, but extended also upon the eyeball. Alt³ has seen cases of such dis-

¹ Münchener medicinische Wochenschrift, February 13, 1900.

² Klin. Monatsbl. f. Augenheilkunde, April, 1900.

³ American Journal of Ophthalmology, February, 1900.

coloration where the patients had used the drug for several months for trachoma. In one case the staining remained unchanged for at least a year; in others it disappeared within three months. But, as he points out, protargol staining is a far less important blemish than the dirty-gray or blue-black appearance of argyrosis caused by silver nitrate.

Other Silver Compounds. The use of the other organic compounds of silver is still so limited that the published accounts furnish an insufficient basis for an estimate of their practical value. J. J. Imre¹ finds argentamin more serviceable in purulent conjunctivitis than is silver nitrate. In 5 per cent. solution it has practically the same effect as the 2 per cent. solution of the nitrate, but without producing pain or inflammatory reaction. Then it is applicable two or three times daily and in all stages of the disease. Daxenberger,² too, claims that in purulent conjunctivitis due to the gonococcus, argentamin is superior to all other preparations of silver. There have been somewhat different preparations put upon the market under this name; but the specimens of the drug that I have tried were decidedly more irritant than protargol, although the burning and smarting they caused, in 5 per cent. solutions, was less severe and much more brief than that produced by the $\frac{1}{2}$ per cent. solution of silver nitrate.

Largin is the most recently introduced of the organic compounds of silver. It contains 11 per cent. of silver, and is a light grayish-white powder. It may be used in 10 per cent. solution. The solution is, however, quickly acted upon by light, becoming a dark brown. Falta,³ who proposed the drug for conjunctival inflammation, did not, however, prefer it to silver nitrate for purulent conjunctivitis, and S. Stephenson⁴ found it inferior to either silver nitrate or protargol in gonorrhœal ophthalmia. This inferiority might not be expected of a drug introduced as having a special value in gonorrhœa and found very useful in some other forms of conjunctivitis.

INFECTIOUS INFLAMMATIONS OF THE CONJUNCTIVA. By here discussing together several forms of conjunctivitis that were last year characterized by their bacterial causes as distinct, I do not wish to give the impression that anything then said as to their classification has been supplanted by the observations since published, for in every respect it has been confirmed. But the bacterial origin of these diseases having been scientifically established, certain practical questions as to conditions and channels of infection arise, which may best be considered with reference to the whole group rather than in regard to each disease separately.

¹ Ungarische Beiträge zur Augenheilkunde, 1900.

² Wochen. f. Therap. u. Hygiene des Auges, October 4, 1900.

³ Wiener med. Wochenschrift, July 25, 1900.

⁴ British Medical Journal, March 17, 1900.

A most important contribution to the subject is the ophthalmic history of the London District School at Hanwell from 1856 to 1900, as told by Sydney Stephenson.¹ The facts he narrates should be made known to managers of boarding-schools and orphan asylums everywhere. The earlier chapters of this history are dark indeed. When Mr. Bowman was asked to investigate the ophthalmic condition of the school in 1862 he found many eyes had been destroyed and there were 686 cases of ophthalmia in the institution. Mr. Nettleship, in 1888, found 375 cases, and the records showed that during the preceding twelve years more than 2000 cases had arisen in the institution beside those introduced from without. Public opinion was finally aroused and radical changes in the buildings and plan of administration inaugurated. When Mr. Stephenson took charge, in 1889, he found 206 cases in the ophthalmic wards, to which were shortly added 186 that had been loose in the school. For the first six months from about 20 to 35 per cent. of the inmates of the school suffered from ophthalmia. In 1894 there remained forty-five children in the ophthalmic division of the school. In 1896 these had dwindled to five. In November, 1898, not a single case remained, and since that time but one had been admitted from the school, and he was suffering from a relapse. The department of the school established for the ophthalmic cases being no longer required for its original purpose, has become in fact a central hospital for the reception of patients from most of the London workhouses, infirmaries, and poor-law schools. The reform which brought such radical results consisted essentially in breaking up immense barracks, built on the corridor system, into distinct isolated buildings, and the establishment of an ophthalmic department to the school. In this department cases of contagious ocular inflammations were isolated, and the regular work of the school was carried on. This latter department took the place of an infirmary, in which the patients were treated for a time, to be sent back into the general school, and then to relapse and infect others. There were also established the regular inspection of the children's eyes, a system of promptly reporting all cases of ocular inflammation, and the exclusion of new cases from the general school.

The great bulk of cases in the endemic that was thus eradicated were cases of trachoma, but the history includes details regarding two epidemics of more acute conjunctivitis. In one of these the outbreak occurred in a ward that contained twenty-one infants and two older girls, who assisted in the care of them. In four days every one of the younger children was attacked. A child in another ward who had gone on an errand to the infected ward two days previously was also

¹ Archives of Ophthalmology, July, 1900.

attacked, and three others in wards closely contiguous. All exposed children were promptly isolated and watched, and no other cases occurred in the institution. On bacteriological examination the Koch-Weeks bacillus of acute contagious conjunctivitis was found in eighteen of these twenty-five cases. In another outbreak a girl was noticed to have some discharge from the eyes. On inspection of the other inmates of the block five others were found showing slight symptoms of conjunctivitis. The following day twelve more cases were discovered and the next day three others. All these cases were promptly sent to the ophthalmic school, and those that had been exposed with them were kept apart from the general school. No more cases developed. All of these cases were examined bacteriologically. Of them, eleven showed diplobacilli, and among these the severity of the symptoms was directly proportioned to the number of organisms found. The other cases showed pneumococci or xerosis bacilli.

Of pneumococcus conjunctivitis J. Hallé¹ reports two cases in which the ocular inflammation was directly due to inoculation of the conjunctiva, with discharges containing the pneumococcus. In one case the interval between inoculation and the appearance of the inflammation was seven days; in the other three days. It happened that the discharges in question had been examined and the pneumococcus found in them, and a bacteriological examination of the conjunctival discharge revealed its presence there. Bacteriological examinations of ninety cases of conjunctivitis occurring at Copenhagen were made by M. K. Lundsgaard.² He found diplobacillus conjunctivitis the most common form, and next in frequency came that due to the pneumococcus. The Koch-Weeks bacillus he found but three times in sporadic cases. Cases due to streptococci, the gonococcus, and the diphtheria bacillus were also encountered. G. Consalvo³ reports an epidemic in which the pneumococcus was found in the conjunctival discharge in all cases. The duration of the attack was usually ten days, but in some instances there was a tendency to become chronic.

The infection of the conjunctiva through the medium of dust in the atmosphere has been the subject of investigation by S. Lobanoff.⁴ He studied especially infection by the so-called xerosis bacillus, the diphtheria bacillus, and the yellow staphylococcus. He found that the ability of the bacteria to resist the influence of drying varied directly with the virulence of the organisms and the vigor of their growth. For a certain culture the power of resistance was at a given time fairly constant, multiple experiments giving essentially similar results, and the

¹ Annales d'Oculistique, March, 1900.

² Ibid., October, 1900.

³ Wiener klin. Wochenschrift, September 30, 1900.

⁴ Graefe's Archiv für Ophthalmologie, December, 1900.

xerosis bacillus infection through the atmosphere seems barely possible. There is more chance for infection through this channel with virulent diphtheria bacilli; yet even with such organisms direct or indirect contact is much more likely to be the channel of infection. The staphylococcus, under drying, preserves its virulence longer. Lobanoff does not undertake, from his experiments, to reason as to atmospheric infection by other bacteria; but there seems to be little to indicate that it is the usual channel for infection with any of those that have been recognized as causing conjunctivitis. The transmission of ocular infection by flies has often been assumed; but Kenneth Scott¹ thinks this must be a rare method, because flies very rarely get a chance to enter the normal conjunctival sac.

Fehr² reports a series of cases of subacute conjunctivitis similar in character traceable to infection in a swimming pool. The symptoms were not those of either the diplobacillus or acute contagious conjunctivitis, and the disease could hardly have been trachoma, since it yielded to treatment in a few weeks. During the past summer several epidemics of conjunctivitis supposed to be due to exposure in swimming baths have been mentioned as occurring in certain American cities. A thorough study of one of these epidemics would probably yield important results, but I am not aware that any such study has yet been made public. In Fehr's cases there was little or no secretion. The subjective symptoms were never severe, and nothing was positively determined by such bacteriological investigation as he was able to make. No great amount of scientific evidence is required to prove that a common swimming pool of stagnant water is necessarily dirty and should be repulsive. It should never be tolerated except when thorough cleansing by a previous shower bath is rigidly enforced.

TRACHOMA. That trachoma is mainly a contagious disease of the eyes seems to me quite certain. Its history in asylums, schools, and armies; its spread in communities after the movements of armies; its extension from the diseased to the previously healthy in the steerage passage across the ocean, and in other situations where overcrowding occurs and proper isolation and cleanliness become impossible, seem to establish its contagious character. But to what extent contagion depends upon exposure and to what extent it is determined by individual susceptibility is quite unknown to us. Neither do we know how far the character of the infection is responsible for the course of the disease or how far this depends on the nutrition and general health of the patient or upon adverse influences, as dust or eye-strain, to which the eye itself may be subjected. The diagnoses given for certain conjunctival dis-

¹ Lancet, August 25, 1900.

² Berliner klin. Wochenschrift, January 1, 1900.

eases vary widely in the practice of different surgeons. Thus in the paper by Fehr, above mentioned, the cases referred to—the cases of conjunctivitis contracted in the swimming bath—are regarded as not being cases of trachoma; while Schultz had previously reported a group of cases, evidently of the same character and originating from the same source, as being cases of genuine trachoma.

This uncertainty as to just what is trachoma has to be borne in mind when reading what is written regarding its classification and pathology. C. Ziem¹ traces the causation of trachoma to dust and miasm, and urges its prevention by the cultivation and preservation of forests, which tend to lessen the dust in the atmosphere, and by special precautions against miasmatic exhalations arising from river overflow or stagnant water. His argument is based chiefly on the geographical distribution of the disease in countries so thickly inhabited that exposure to contagion by contact is possible to everyone. It is well known that when exposure becomes universal infectious diseases are apt to be ascribed to other causes than infection. Thus cholera in India and smallpox in China are not generally regarded as infectious diseases.

Approaching it from another point of view, S. Bach² associates trachoma with scrofula, and finds that it always occurs in persons of a scrofulous diathesis or in these persons runs a more severe and chronic course. It is not improbable that dust and scrofula may be important factors in the etiology of trachoma, but it is very unlikely that specific infection can be excluded. D. Gromakowski,³ in a study of the bacteriology of follicular disease of the conjunctiva at Kiev, makes trachomatous conjunctivitis one of his four classes of cases. The organism that he found most frequently present in this class was a small rod, similar to the Koch-Weeks bacillus. He thinks, however, that in most cases the follicles were present before the onset of infection with this bacillus. He also found various other bacteria present in these cases. He thinks trachoma arises from infection by various organisms, and ascribes great importance to exposure to dust. Addario,⁴ from his anatomical and bacteriological investigations, concludes that trachoma is due to a specific cause, which acts from definite centres of infection. But he contents himself with some account of the bacteria found in connection with it without attempting to designate any specific trachoma germ.

Treatment. As to the treatment of trachoma, much has been written during the past year, though little that is decidedly new. J. Masselon⁵

¹ Wiener klin. Wochenschrift, October 11, 1900.

² Münchener medicinische Wochenschrift, February 20, 1900.

³ Archiv f. Augenheilkunde, Bd. xli., p. 2.

⁴ Ibid., March, 1900.

⁵ La Clinique Ophthalmologique, April 25, 1900.

protests against what he terms the unjustified abandonment of jequirity for the newer operative methods of treatment. He gives cases of pannus in which the relief afforded by jequirity was certainly as prompt and complete as could be hoped for from any other method. The best way to apply it he finds to be the dusting of the lid with an impalpable powder of the bean (as advocated years ago by Cheatham) rather than in the infusion, which has been more commonly employed. The powder is permitted to remain in contact with the conjunctiva for from three to five minutes and then washed away.

De Lapersonne and Paunblain¹ report an experimental study of the action of jequirity both on the healthy conjunctiva of rabbits and in trachoma in man. They prefer a 1 per cent. infusion of the drug, which should be made fresh every five or six days. After cocainizing the conjunctiva this infusion is rubbed into the palpebral portion with a cotton swab. Usually a second application of the same kind is necessary to produce a sufficient reaction, which is attended with the formation of a false membrane at the end of about forty-eight hours. They, too, emphasize the rapid disappearance of pannus under this method of treatment. Their paper was presented at the International Medical Congress in Paris. In discussing it Menacho² also testified to the brilliant results obtained with jequirity in pannus, but called attention to the fact that it was contraindicated when there was free secretion from the conjunctiva. Ostwalt pointed out that the activity of the infusion could be diminished by exposure to a temperature of less than 90° C. Kuhnt opposed the use of jequirity, being better satisfied with the surgical treatment by use of the forceps which he had invented. Galezowski depends on excision of the conjunctival cul-de-sac.

There can be no doubt that some danger attends the use of jequirity by methods that have been most widely employed and recommended ; but I think that by the use of an impalpable powder, subsequently washed away or even allowed to remain until removed by tears, or by the use of the 1 per cent. solution, this danger is very slight, if indeed it be not wholly avoided. In the bad cases, where the patient is practically blind from pannus, the employment of jequirity is certainly the one measure to be considered along with operative intervention. And it may even be a question of personal preference upon the part of the surgeon, or even of the patient, which should be resorted to.

The treatment of trachoma by the local application of iodic acid (IO₃H) is advocated by A. Schiele.³ He employs the solid stick for touching the palpebral conjunctiva, very much as one would use copper

¹ Archives d'Ophtalmologie, August, 1900.

² Annales d'Oculistique, August 11, 1900.

³ Centralblatt f. prakt. Augenheilkunde, April, 1900.

sulphate. The stick may be of pure iodic acid, or 1 part of gum arabic may be added to 15 of the acid to make it more firm. The application causes severe pain of rather brief duration, which can largely be prevented by the previous use of a local anæsthetic. The contact of the acid causes the conjunctiva to burn brown, but no scar results. He has also used the acid in solution. For dropping into the eye the strength should not be over 3 per cent., but stronger solutions may be brushed upon the everted lids. Schiele has also employed gallicin and iodogallicin in the treatment of trachoma: the former as an impalpable powder, dusted into the conjunctiva; the latter in the same way, or in a salve containing 5 per cent. of the drug.

The suggestion of Nesnamoff¹ as to the use of iodine in the treatment of trachoma seems to me not to have attracted the attention that it deserves. In a disease for which the usual remedies so often lose, after a time, their power to benefit, it is important to extend the list of those to which we can turn with confidence, and the addition of iodine solutions to this list is certainly a valuable one. H. H. Seabrook,² from a trial of a year and a half, has found the treatment mild and efficient in all forms of conjunctival diseases classed as follicular or granular that are chronic in type and show little secretion. The iodine may be dissolved in liquid petrolatum, in the strength of 1 to 2 per cent., or a solution of similar strength may be made in glycerin. Applications are made once each day or two to the everted lids.

VACCINIA OF THE CONJUNCTIVA. A. Pihl³ reports two cases occurring in girls, aged two and a half and four years, contemporaneous with the lesions of the arm following vaccination. The usual vaccine sore and the general symptoms were especially severe. There was violent conjunctivitis and much swelling of the lids. Upon the conjunctival surface of the upper lid in one case and on the lid margin in the other case were found what seemed to be instances of the vaccinal eruption. The ocular inflammation subsided rapidly with the subsidence of the general symptoms and of the lesions of the arm. Recovery was practically complete. Laqueur⁴ also reports a case occurring in a man, who, without care to cleanse his hands, had attended his son, whose arm was sore from vaccination. There was severe conjunctivitis and blepharitis, which ran the course of vaccinia, and bacteriological examinations of lymph from the affected tissue showed the presence of the bacteria constantly found in vaccine lymph. The practical points with regard to this form of conjunctival inflammation are its apparent severity and its prompt and complete recovery under soothing applications or without

¹ Vratich, 1895.

² New York Eye and Ear Infirmary Reports, 1900.

³ Klin. Monatsbl. f. Augenheilkunde, July, 1900.

⁴ Klin. Therap. Wochenschrift, October 7, 1900.

special treatment. These characteristics make the recognition of its cause important.

HYPERÆMIA OF THE CONJUNCTIVA. As a class of cases that had given him a great deal of trouble, J. W. Bullard¹ calls attention to chronic hyperæmia of the conjunctiva, or dry catarrh. The globe of the eye may become flushed, but usually the palpebral portion is chiefly affected. In the milder form the meshes of the vessels are noticeable; but in severer cases there is intense redness, swelling, and even such tension of the lid that it is tender on pressure. The affection is aggravated by attempts to use the eyes, dust, wind, bright sunlight, and artificial light. This class of cases is more important than might be supposed from the brief reference to it in the text-books. Sometimes the condition proves extremely obstinate, exhausting the resources of one adviser after another and getting but imperfect relief in the end. Care in the use of the eyes, the correction of errors of refraction, attention to nasal diseases or diathetic conditions must all be carefully attended to. Each of these measures will relieve some cases, but there are a few for whom all remedies yet suggested prove insufficient. The practitioner should be slow to assume that he has encountered one of these, but where patient study and careful treatment fail, it may be some comfort for him to know that others have to admit similar failures.

Rosenbach² describes, under the name conjunctival asthma, a form of hyperæmia occurring periodically in plethoric individuals between forty and fifty years of age, often with hyperæmia of the nasal mucous membrane and feelings of heaviness and mental depression. He was able to afford only temporary relief by the instillation of cocaine. In some cases of hyperæmia I have found holocaine not only to lessen the discomfort, but also apparently to influence favorably the general condition of chronic hyperæmia of the conjunctiva. It is certainly a far safer application than cocaine in cases of this class.

PERIODIC BRIEF EPISCLERITIS is little more than a recurring and markedly painful hyperæmia, involving most noticeably the bulbar portion of the conjunctiva and the tissue immediately beneath it. W. Stoeltzing³ is satisfied that the condition depends upon the vasomotor nerves of the part. He finds it accompanied or preceded by neuralgic pain. In his cases great benefit was derived from the regular administration of potassium iodide. When this was stopped the hyperæmia recurred, but ceased when the drug was again used.

Pemphigus or Essential Shrinking of the Conjunctiva. This condition has so little in common with pemphigus of the skin that the

¹ American Journal of Ophthalmology, April, 1900.

² Wochenschrift f. Therapie u. Hygiene des Auges, June, 7, 1900.

³ Münchener medicinische Wochenschrift, February 13, 1900.

dermatologists recognize no connection between them; but then they do not agree among themselves as to what is pemphigus of the skin, or perhaps they do agree that it includes several different conditions of the essential nature of which little is known. So long as this is the case, and since three out of four cases of this conjunctival disease are attended with pemphigus of the skin, it may be proper to retain the term. E. Franke¹ has published a monograph upon the subject in which he favors the adoption of the term essential shrinkage of the conjunctiva; but it seems not unlikely that we have another condition for which the latter term might be reserved. Franke reports five cases and reviews critically 102 cases previously reported. He finds that vesicles, to which such importance attaches in pemphigus of the skin, have been noted only on fourteen of these cases, and that it is the shrinkage of the conjunctiva which is the characteristic alteration. Franke points out that the prognosis is bad, and in reviewing his monograph H. Knapp² characterizes it as "hopeless," but suggests that there may be an earlier curable stage, which should be sought for among cases of cutaneous pemphigus. The unfavorable prognosis is also noted by J. V. Michel,³ who reports six cases. He thinks it safe to regard as of this character any case in which conjunctival adhesions arise that are not due to previous injury or the application of a caustic. A case reported by W. B. Marple⁴ was under observation two and a half years, and continued progressive in spite of local applications and operative treatment, including skin-grafting.

Doyme and Juler exhibited cases before the Ophthalmological Society of the United Kingdom.⁵ Doyme's case, in an old man, had progressed to bare light perception in one eye. Juler's, in a young woman, was just commencing to affect one eye. In discussing these J. R. Lunn referred to a case in which there were recurrent attacks of vesicles on the cornea associated with bullæ all over the body; yet after three such attacks the patient, a boy, aged twelve years, recovered, although he had pemphigus of the skin, and other mucous membranes than the conjunctiva.

Tuberculosis of the Conjunctiva is another rare condition which has figured quite largely in the literature of the past year. J. W. H. Eyre⁶ believes it is not so common as has been supposed. He has encountered eight cases among 31,000 cases of eye disease. In the diagnosis, micro-

¹ Der Pemphigus u. die Essentielle Schrumpfung der Bindehaut.

² Archives of Ophthalmology, September, 1900.

³ Zeitschrift f. Augenheilkunde, June, 1900.

⁴ New York Eye and Ear Infirmary Reports, 1900.

⁵ Transactions of Ophthalmological Society of United Kingdom, January 25, 1900.

⁶ Archives of Ophthalmology, January, 1900.

scopical examination of the tissue frequently fails to throw any light upon the case, and inoculation experiments must be resorted to. The clinical appearances vary. In some cases there are miliary ulcers on the conjunctiva which tend to become cheesy. In others there are grayish or yellowish nodules beneath the conjunctiva which look like tubercles, and are followed later by outgrowths of granulation tissue associated with œdema and thickening of the lids. These outgrowths are likely to spring from the fornix, and may become pedunculated and acquire the appearance of a cock's comb. They are jelly-like and often superficially ulcerated. In rare cases the growth becomes a distinctly pedunculated tumor having the appearance of a papilloma or fibroma. The condition is commonly unilateral and is extremely chronic. The preauricular gland of the same side is affected early, although, as Reimar points out, this is not an invariable symptom, since it was absent in one of his cases. Eyre reports three cases, Vieusse¹ reports two cases, M. Reimar² two cases, A. Birch-Hirschfeld and W. Hausmann³ three cases, Aurand,⁴ Jessop⁵, J. H. Fisher,⁶ and Lagrange⁷ each report one case. Of the fourteen cases but two were over twenty-one years of age, the oldest patient being twenty-six, while the youngest was four, and the average was fifteen years. In two cases the condition was observed shortly after injury of the eye. In one case it seemed to be consecutive to tuberculosis of the nasal fossæ and lachrymal passages, and in another there was a previous lupus of the face, but in the other cases the tuberculosis appeared to be primary in the conjunctiva.

TREATMENT. The prognosis of such primary tuberculosis depends chiefly on the treatment. Untreated, it is extremely chronic and is likely to be the starting-point of a general tuberculous infection; but thorough removal of the diseased tissue effects a permanent cure. Spontaneous recovery has been reported, and Reimar regards one of his cases as an instance of this. It is to be noted, however, that he used iodoform as a local application, and that this was also used in other cases of recovery without operation. J. Taylor⁸ recommends applications of lactic acid in progressively stronger solutions from 25 to 90 per cent. G. A. Critchett suggests destruction of the granulations with sodium ethylate. Other writers generally agree that prompt removal, usually with the cleansing out of the preauricular gland, is the proper treatment. Very thorough scraping away of the affected tissue has been a favorite method; but Reimar objects that, by opening

¹ Recueil d'Ophthalmologie, January, 1900.

² Klin. Monats. f. Augenheilk., February, 1900.

⁴ Annales d'Oculistique, August, 1900.

⁶ Ibid., November, 1900.

⁸ Ophthalmic Review, November, 1900, p. 330.

³ Ibid., October, 1900.

⁵ Ophthalmic Review, August, 1900.

⁷ Archiv d'Ophthalmologie, July, 1900.

the lymph spaces of normal tissue, this might favor general infection. No such objection can be urged against destruction with the galvanic cautery, which is recommended by Jessup and Holmes Spicer.¹ The treatment by injections of tuberculin has not proved efficient.

Tumors of the Conjunctiva. G. E. de Schweinitz² reports a case of papilloma, springing from the plica semilunaris, presented in a negro, aged fifty years. The tumor, which had been present for many years, was pedunculated, presented the typical cauliflower appearance, and measured 5 by 6 mm. at its broadest part. Best³ reports a similar case occurring in a man, aged twenty-four years, who gave a history of preceding injury to the part. The tumor was about 3 mm. in diameter, and, as in the preceding case, the caruncle and other portions of the conjunctiva were not involved. Vollaro⁴ reports a case of lymphosarcoma arising from the plica by a peduncle that permitted it to protrude between the lids. It occurred in a girl, aged thirteen years.

A case of symmetrical papillomatous tumor of both eyes is reported by W. A. Shoemaker.⁵ The patient was a man, aged forty years, who gave a history of inflamed eyes for twenty-five years. In the right eye the growth extended entirely across the cornea, 7 mm. wide and 2 mm. thick. In the left eye a growth from 3 to 9 mm. wide extended from the outer canthus 4 mm. upon the cornea, while at the nasal side of the cornea was a pterygium-like mass extending to the inner canthus. The tumors were removed and examined by A. Alt, and were found to be of the nature of papillomata, which were taking on a malignant character. O. K. v. Reichtperg⁶ reports three cases of papilloma of the conjunctiva, one of which had undergone malignant degeneration, and two cases of epithelioma with papillomatous proliferation of the conjunctiva. His patients varied from forty-five to seventy-three years of age, and the tumors had been noticed for periods varying from one to seven years. In one of the cases of papilloma there was a history of injury. A case of papilloma springing from the bulbar conjunctiva and covering the temporal half of the cornea is reported by S. D. Risley and E. A. Shumway.⁷ In this case, too, a portion of the growth had undergone carcinomatous degeneration. The tendency of these growths to become carcinomatous, and the impossibility of judging from their appearance when such a change takes place, make it important to remove them at the earliest stage possible; and the removal should be

¹ Ophthalmic Review, August, 1900.

² Transactions of American Ophthalmological Society, 1900.

³ Klin. Monatsbl. f. Augenheilkunde, August, 1900.

⁴ Annals of Ophthalmology, July, 1900, p. 530.

⁵ American Journal of Ophthalmology, March, 1900.

⁶ Graefe's Archiv f. Ophthalmologie, October, 1900.

⁷ Section on Ophthalmology of College of Physicians, Philadelphia, January, 1900.

complete, for they show a strong tendency to recur even when the microscope reveals no evidence of carcinomatous change.

DISEASES OF THE CORNEA.

Corneal Ulcer. Under the head of marginal ulcerative keratitis W. A. Martin¹ describes a form of corneal disease in which a line of small, infiltrated spots appears, parallel to the margin of the cornea, about in the position of the arcus senilis, and is accompanied by hyperemia of the corresponding part of the pericorneal zone. In a few days these spots break down, giving place to a linear ulcer. Then a new portion of the corneal circumference may be involved and the ulcer extended until it has successively encircled the cornea. Martin has noticed no tendency to more general involvement of the cornea in the process, and under weak solutions of mercuric chloride or dusting the surface with calomel the ulcers have promptly healed. The cases he has reported have occurred in persons who have reached or passed middle life. The disease differs from the commonly recognized cases of marginal keratitis, which are interstitial in character, chronic in course, and commence at the scleral margin. In this disease there has always been a zone of transparent cornea between the sclera and the ulcer.

An extended study of the corneal lesions attending subacute conjunctivitis due to the diplobacillus of Axenfeld and Morax has been made by Paul Petit.² He reports ten cases of such lesions, but concludes that in the mass of cases the effects of the bacillus are limited to the conjunctiva, and that when the cornea is involved the resulting ulcer is usually not dangerous. Ulcers of this kind are situated at the periphery of the cornea and show little tendency to extend, either superficially or in depth. The discharge from the surface of the ulcer is likely to contain the diplobacillus in pure culture. A collyrium of zinc sulphate, 2.5 per cent., brings about a rapid and complete cure of the corneal lesion, just as it does of the conjunctivitis.

SERPENT ULCER. E. Alvarado³ observed among 348 cases of keratitis fifty-seven of serpigenous ulcer. It most frequently follows accidental injuries of the cornea during reaping, but also occurs from similar accidents connected with the pruning of vines and cutting of brush on the mountains. On these accounts it is more frequent in summer (in Castile), when more persons are engaged in such operations. But not all such traumatisms produce serpent ulcer. Its occurrence appears to depend on a source of infection that the patient carries with him.

¹ Ophthalmic Record, August, 1900.

² Annales d'Oculistique, February, 1900.

³ Annals of Ophthalmology, July, 1900, p. 511

The connection of serpent ulcer with pneumococcus infection I have sufficiently discussed last year.¹ Nothing opposing or tending to modify the views there expressed has since appeared, although P. Petit,² in a careful microscopical study of a case of hypopyon ulcer, which started as a serpent ulcer, found a diplococcus, which, however, he did not positively identify as the so-called pneumococcus.

RODENT AND DENDRITIC ULCERS are comparatively rare forms of corneal disease. Hillemans³ reports three cases of the latter, which he believes to be due not to infection, but to disease of the nerves governing the nutrition of the cornea. The ulceration tends to extend superficially, and the portion of the cornea that has suffered from it is left thin, clouded, and anæsthetic. He advises warm fomentations, atropine, and touching the surface of the ulcer with carbolic acid or tincture of iodine.

H. Friedenwald⁴ strongly recommends the use of the tincture of iodine for the treatment of both dendritic and rodent ulcers. He claims thus to have treated more than twenty-five cases without a failure to bring relief and without producing untoward symptoms. His method of application is as follows: "A bit of absorbent cotton is wrapped firmly about a fine wood toothpick so as to form a narrow, firm swab. This is dipped into the tincture of iodine and the excess allowed to drop off. The eye having been prepared by instilling cocaine and a drop of fluorescein, the ulcerated area is thoroughly scrubbed until a distinct brown discoloration of the tissues is seen. The neighboring epithelium is very much loosened and curls up in all directions. It is important to touch this and especially the minute infiltrations seen a millimetre or two away from the main line of ulceration, for the progress of the disease is usually this, that after these fine infiltrations are observed the furrowed ulceration soon makes its appearance." He has never seen harm from using the iodine too freely, and it has never been necessary to apply it more than twice. The application usually causes some pain, which lasts for a few hours.

Friedenwald explains the large number of cases he reports (having seen twenty-five in less than two years) to the habitual examining of all corneal lesions with fluorescein and the loupe. This has led him to the conclusion that many ulcers commonly looked upon as simple or herpetic are really dendritic. He has also seen very rapid improvement from the use of iodine in deep ulcers at the margin of the cornea, but in other forms of corneal ulcer it is without effect.

¹ PROGRESSIVE MEDICINE, June, 1900.

² Annales d'Oculistique, October, 1900.

³ Archiv f. Augenheilkunde, Band xl., Abt. 1.

⁴ Transactions of American Ophthalmological Society, 1900.

Electrolysis is employed in the treatment of corneal ulcers by F. Cornwall¹ in those conditions of chronic ulcer for which the galvanocautery is sometimes employed. He uses a current of not over one-quarter milliampère and of low voltage, and keeps the dispersion electrode as near as possible to the operating electrode.

Disease of this kind, although it more frequently affects the conjunctiva, proves intractable and dangerous by its involvement of the cornea, so that from the point of view of practical importance it is best considered a corneal disease.

Phlyctenular and Scrofulous Ophthalmia. S. Stephenson² has collected and analyzed 669 cases of phlyctenular disease of the eye, with especial reference to its causation. He concludes that it is remotely due to the tubercular diathesis, and more immediately to an eruption of eczema on the surface of the eyeball. The exciting causes he finds to be faulty hygiene, acute disease, and slight local injuries. In 13 per cent. of his cases the acute specific diseases of childhood were mentioned as causes; in 32 per cent. there was noted tubercle or a tubercular tendency, while in 53 per cent. eczema was present or was known to have preceded or followed the phlyctenular outbreak. The prevalence of the disease is indicated by the fact that one out of every four or five patients at a children's hospital suffered from it.

H. Gradle³ raises the question whether scrofulous keratitis, including phlyctenular and allied types of corneal disease, which occur mainly in distinctly scrofulous persons, may not always be evidence of a tubercular focus somewhere in the lymphatic system. He does not mean that they are lesions due to the local presence of the tubercle bacillus, but that they only occur in those who are under the influence of poisons produced by that bacillus present in one or more lymph glands. He suggests that this question could be answered by a general application of the tuberculin test in these cases. He has employed tuberculin injections in four patients, obtaining a positive febrile reaction in every case, although two of the children were apparently not scrofulous.

The unsettled and various views of the profession as to the etiology of these conditions was well illustrated in the discussion brought out by Gradle's paper when read at the section of the American Medical Association. Excessively hot weather, inherited syphilis, digestive disturbances, especially errors of diet, diseases of the nose or pharynx, a specific infection, an abnormal nerve influence, lack of good red blood-corpuscles, local irritants, teething, and errors of refraction were each

¹ Archives of Ophthalmology, January, 1900.

² British Medical Journal, October 6, 1900.

³ Journal of the American Medical Association, August 11, 1900.

mentioned as the important factor in causation. K. Baas,¹ in an elaborate discussion of the anatomy and pathogenesis of pannus and phlyctenules, although he speaks of the two conditions as trachomatous pannus and scrofulous pannus, finds them anatomically and pathologically different. He finds bacteria to be the essential outside irritant in causing the phlyctenule, but beyond this reaches no definite conclusions. The local lesions seem to be as indefinite as the general condition termed scrofula.

TREATMENT. In regard to the treatment of these conditions little new is suggested. Gradle in some cases saw great benefit from large doses of sodium salicylate. He advises two-thirds of a grain at a dose three or four times a day. Small doses were useless. If improvement was not manifest within two days it was useless to continue the drug. Heddaeus² turns back to the mercurials. These have been of such benefit when used locally that he has resorted to inunctions of mercurial ointment and the internal administration of calomel, as he thinks, with great benefit.

It seems altogether probable that the phlyctenule is a reaction of the epithelial layer to widely differing influences, but it may be more frequently associated with certain of these than with others. The persistent disposition to call certain forms of ophthalmia scrofulous—which remains, despite the tendency of a newer pathology to scatter under different headings, the manifestations of disease heretofore grouped as scrofula—probably has some basis in fact. The statistics of Stephenson give some support to the suggestion of Gradle, and it is well worth while to give a wider trial to the tuberculin test in these cases. Meanwhile there is no reason to ignore what we know of the practical value of diet, general hygiene, and the treatment of nasal disease in the management of such cases.

R. H. Sensburg³ reports a case of corneal ulcer occurring in a woman who had suffered for years from lupus of the face, in which the microscopical examination revealed the tubercle bacillus in the scrapings of the ulcer. Under atropine, warm compresses, powdered iodoform, and an occlusive dressing the ulcer healed entirely in about eight weeks.

Ophthalmia Nodosa. This form of chronic inflammation, resulting from embedded caterpillar hairs, is most likely to involve the cornea. Bayer⁴ reports a case in which, three months after the injury that caused the trouble, the cornea was found hazy, somewhat vascular, and presenting three yellowish-white spots the size of a pinhead. After some

¹ Klin. Monatsbl. f. Augenheilkunde, June, 1900.

² Wochenschrift f. Therap. u. Hygiene des Auges, April 26, 1900.

³ La Clinique Ophthalmologique, April 25, 1900.

⁴ Münchener medicinische Wochenschrift, May 22, 1900.

improvement in the general condition of the eye fragments of caterpillar hairs were discovered extending from these nodules into the anterior chamber. In this case the iris was also involved. Bayer believes that the hairs do not originally penetrate to the depth at which they are subsequently found, but wander into the deeper parts by means of the pathological changes excited by their presence.

W. Reis¹ reports a case which applied at the Bonn Eye Clinic, giving the history of a blow in the right eye from a twig six weeks before. She was treated a month, and then Saemisch (who originally described this disease) saw her and recognized the case as one of ophthalmia nodosa; then the patient added the information that there was a caterpillar on the twig that struck her eye. It is certain that this form of ophthalmia occurs more frequently than it is recognized. Often the history of the injury causing it is not obtained, and it may even be forgotten before the lesions reach their height. In Bayer's case there was a clear history that the eye had been struck by a large, dark brown caterpillar at the time of the onset of the symptoms.

Annular Keratitis. A. Vossius,² in 1885, described two cases of a condition which he called central annular interstitial keratitis; and in 1890, J. Pfister³ reported five similar cases. To these K. Grunert⁴ now adds the records of seven cases observed in the last six years in the University Eye Clinic at Tübingen. The number of cases thus reported by single observers suggests that the condition is not very rare. It probably has been overlooked or neglected by others as an unimportant variety of interstitial keratitis, but Grunert's paper seems to demonstrate that it should be recognized as a distinct form of corneal disease. It begins with photophobia, hyperæmia, and other symptoms of moderate irritation, with some diffused clouding of the cornea.

Soon the ring of opacity which gives the condition its name appears and becomes more definite. It is situated near the centre of the cornea, is 1 or 2 mm. in diameter, and of about the same breadth. A second or even a third partial ring, concentric with it, may be noticed outside of the principal one. This ring of opacity is situated deep in the corneal tissue. It may be circular, oval, or somewhat irregular in shape. Vossius describes his cases as showing the ring concentric with the cornea; but none of Grunert's cases were exactly so, although the corneal centre was always included within the ring. Sometimes the ring was complete. Sometimes it was open on one side. The epithelium over the opacity was usually stippled, and in some cases there was

¹ Klinische Monatsblätter f. Augenheilk., December, 1900.

² Berliner klin. Wochenschrift, 1885, xliii.-xliv

³ Klin. Monatsbl. f. Augenheilkunde, 1890, p. 114.

⁴ Supplement to Klin. Monatsbl. f. Augenheilk., 1900.

slight ulceration. In the later stages a few vessels could be found extending out through the parenchyma of the cornea, but these were never numerous or striking. In ten of the twenty-two cases both eyes were affected. The cases were equally divided between the two sexes. The ages of the patients vary from five to fifty-two years, but the great majority of cases occur between twenty and forty. Slight corneal anæsthesia was noted in some cases over the affected areas.

The ETIOLOGY of the affection is obscure, but no connection with tuberculosis or syphilis could be recognized. In this respect, and in the age of the patients, annular keratitis contrasts strongly with the usual forms of interstitial keratitis. The prognosis is comparatively good. There was always retained a central portion of the cornea, affording useful vision, the best results being obtained in cases that came under treatment early. Bacteriological investigations revealed only the ordinary bacteria of the conjunctiva. The most effective treatment has been the use of atropin in the stage of inflammation; and later the ointment of yellow oxide of mercury, as strong as 5 per cent. In the cases longest under observation (four and five years) there still remained a ring of opacity, and this ring had shown no tendency to diminish in diameter until it narrowed down to a single central spot of infiltration, as described by Vossius.

Interstitial Keratitis. Some rare forms of keratitis due to syphilis are discussed by Wicherkiewicz.¹ He believes that cases of parenchymatous keratitis are ascribed to syphilis which are really due to other causes, especially scrofula. But he points out that the absence of the signs of inherited syphilis, specified by Hutchinson, is not always proof that a keratitis is not of syphilitic origin. Beside the common form of interstitial keratitis and the keratomalacia of the new-born, he ascribes to syphilis certain infiltrations of a grayish-yellow color, sometimes solitary, sometimes in groups, deep or superficial, which after a time disappear, leaving a corresponding slight opacity of the cornea; and also a keratitis limited to one portion of the cornea and followed by some opacity.

Nodular, syphilitic keratitis and partial, marginal, interstitial keratitis he finds sometimes masked by scrofulous keratitis; or, even if the distinction be really clear at the start, a mistaken diagnosis may be made on account of their great resemblance. Such mistakes are to be avoided by a careful consideration of the general condition of the patient and his personal and family history and by noting these points of difference in appearance: The nodular syphilitic keratitis makes more of an elevation of the corneal surface, its color is more yellow than gray, it lacks

¹ Annales d'Oculistique, November, 1900.

superficial vessels, but receives deep vessels arranged in loops, and it shows no tendency toward softening. On the other hand, phlyctenular keratitis presents a gray infiltration, often with vessels, which are frequently superficial, shows strong tendency to ulceration, and is accompanied with more evidence of irritation of the whole eye.

That interstitial keratitis may occur late in acquired syphilis is well known. E. C. Ellett¹ reports a case he regards as of this character. It occurred twenty-three years after the initial lesion, but other tertiary manifestations had been occurring for five or six years. A striking fact about the case was that these late manifestations, including the keratitis, all occurred on the right side; still, the history seemed very clear and the character of the corneal lesion distinctly syphilitic.

TREATMENT. Under "mixed treatment"—with atropine locally, followed later by ointment of yellow oxide of mercury to remove the opacity—vision of 15/XX was recovered.

P. A. Callan² discusses the question, Can interstitial keratitis be prevented in the offspring of syphilitic parents? He finds that in a certain proportion of cases, at least, such prevention is impossible.

In the general treatment of interstitial keratitis E. Gutmann³ considers mercury quite useless except in small children who may be regarded as still in the secondary stage of syphilis. In these calomel may be valuable. Again, he thinks atropine only of use as a dilator of the pupil, and that as posterior synechia rarely results its instillation at intervals of one or two weeks will usually be sufficient. He thinks no one would expect atropine to modify the corneal process. Here he is in error. There is much to show that atropine does influence the corneal processes directly. Its effect in relieving the pain of corneal abrasions is very striking, and the influence it possesses, in common with other similar mydriatics (and in common with eserine), in quickening the circulation in the pericorneal vessels on which the nutrition of the cornea depends is one of its most common and striking physiological influences. The most common evidence of this I have pointed out before, when discussing the use of such drugs as cycloplegics; but its practical significance has not been fully appreciated, and it seems fair here to oppose it to the suggestion to drop atropine largely from the treatment of interstitial keratitis on account of theoretical considerations.

Gutmann advises the avoidance of irritant applications during the stage of irritation. This is well. But he also advises the systematic use of cocaine, which he thinks affects favorably the corneal condition. This last suggestion should be followed with great caution. Cocaine

¹ Ophthalmic Record, June, 1900.

² Medical News, February 2, 1901, p. 192.

³ Wiener klin. Rundschau, February 11, 1900.

has been very harmful in many cases of corneal inflammation, and for this use it should be employed only in weak solutions. The influence of cocaine on the corneal nutrition is so marked that one need not fear that a weak solution (1:1000 or even weaker) will be wholly inert. In such solutions it may be worthy of a cautious trial.

Involvement of the Cornea in Herpes Zoster. It is well known that zoster affecting the region supplied by the ophthalmic branch of the fifth nerve may be followed by an intractable corneal ulcer or by deep inflammation and opacity of the cornea without ulceration. Terrien¹ reports a reversal of the order of these manifestations of the abnormal nerve influence. The first symptom was discomfort in the eye, with hyperæmia of the upper outer quadrant of the pericorneal zone and a diffuse, deep infiltration throughout the upper part of the cornea. This condition continued for about two weeks without material alteration, and was regarded as a rheumatic scleritis, as the patient was somewhat rheumatic. At the end of this time, however, severe neuralgic pain was felt over the distribution of the ophthalmic branch, and an eruption of the usual herpetic vessels appeared on the forehead, with small vesicles on the conjunctiva. The general sensibility of the affected parts was lowered, and from that time the case ran the usual course of herpes zoster, terminating in recovery in two and a half months.

Corneal Opacities. Cases of peculiar crescentic opacities, compared to arcus senilis on account of their form and situation, are reported by W. E. Gamble² and Adams Frost.³ In the former case the opacity followed trachoma, and was probably a peculiar form of pannus. In the latter the opacity was situated in the deeper layers of the cornea, and there was no history of trachoma. The danger of producing opacity by treating corneal ulcer with lotions containing lead-water has long been recognized. In the last few years several such opacities examined chemically showed no evidence of the presence of lead, so that the view that they always consist of some precipitated salt of lead is no longer tenable. But that they may contain lead is shown by a case reported by E. C. Ellett.⁴ The patient had used a solution of sugar of lead for some days for corneal ulcer. There resulted a scale-like, white deposit, running almost across the cornea and 4 mm. wide. The scale was detached under holocaine anæsthesia and parts of it subjected to microchemical examination gave the usual reactions of lead. The surface left by the removal of the scale healed in a few days under protective treatment.

¹ Archives d'Ophtalmologie, August, 1900.

² Ophthalmic Record, May, 1900, p. 248.

³ Transactions of Ophthalmological Society of United Kingdom, July 6, 1900.

⁴ Ophthalmic Record, June, 1900.

BAND OPACITY OF THE CORNEA. The peculiar superficial opacity of the cornea occupying the portion most exposed by the opening of the lids, which is frequently encountered in eyes that have undergone degenerative changes, and which more rarely occurs in the otherwise normal eyes of old people, has been the subject of special study by Best and G. Manzutto.¹ The latter reports two cases observed in eyes the seat of senile cataract, but otherwise healthy; and he has collected twenty-three cases of the same condition previously reported. He finds that it develops at an advanced age, causing slow diminution of vision, with dazzling and excessive lachrymation when the eye is exposed to strong light. Its upper and lower edges are mostly well defined, and its ends usually separated from the corneal margin by a narrow strip of transparent cornea. The opacity is gray or brown and finely granular, and the corneal surface over it is usually smooth. Both eyes are mostly affected, and it has been noted more frequently in men. The best treatment for the condition is the mechanical removing of the opacity. In a few cases in which the deposit appeared to be almost entirely of lime salts, removal has been effected by the application of weak acids.

Best describes the similar film occurring in eyes that have undergone extensive degenerative changes. In these cases the surface is rarely smooth. The anterior epithelium of the cornea is found thickened and irregular. Bowman's membrane is broken up, and the anterior layers of the corneal tissue are involved. Microchemical study of the infiltrate shows that it is at first fibrinous and then becomes the seat of calcareous deposit, but it remains throughout composed largely of albuminous material. Best concludes that the disease process is one which differs from ordinary inflammation because of the altered nutrition of the tissues and the peculiar irritation due to exposure of the cornea. He thinks that the granular material deposited is the excess of nutriment which cannot be utilized by the tissues on account of their lowered vitality. The roughening of the cornea produced by such a deposit may cause sufficient irritation of the lids to constitute it an indication for removal of the eyeball or at least for keratectomy. The mere removal of the film in these degenerative cases is not likely to be followed by satisfactory healing.

TREATMENT OF PANNUS. The beneficial effects of jequirity upon pannus have been referred to in speaking of the treatment of trachoma. S. Bach² reports a case in which a similar clearing up of the corneal opacity was brought about by a severe attack of erysipelas. The improvement was very marked when at the end of two weeks the swelling of the lids had so subsided as to permit the opening of the eyes.

¹ Beiträge zur Augenheilkunde, 1900, parts xliii. and xliv.

² Klin. Monatsbl. f. Augenheilk., February, 1900.

Conical Cornea. The thickening of the cornea in keratoconus has been the subject of an experimental study in dogs by R. Plaut. The condition was produced by wounding the membrane of Descemet rather extensively by a needle introduced through the corneal margin. In each experiment the cornea was found thickened rather than stretched. Plaut¹ also reports a similar thickening in the cornea operated upon for this condition in the Rostock Eye Clinic. The central portion of the protrusion was found to be three times the normal thickness. Plaut² has also studied the keratoconus produced along with cataract by electrical discharges, and finds that it also is a thickening and not a distention of the cornea. This thickening of the cornea at the region of greatest protrusion was noticed by some of the older observers, Himly and others; but it is quite the opposite of what has been generally assumed and often specifically stated by later authorities to be the condition present. The supposed thinning of the membrane has been given as the explanation of the tendency of conical cornea to grow worse. The thickening found by Plaut in his experiments might be regarded as peculiar to conical cornea produced by those particular injuries; but the history of the case he reports is the history of a bad case of conical cornea arising without previous injury. If this thickening is really present in most cases it will materially affect our views of the pathology of the condition.

The TREATMENT of conical cornea was the subject of a discussion at the last meeting of the American Medical Association. S. M. Burnett³ found in the optical treatment that the careful correction of accompanying regular astigmatism and myopia or hyperopia was most important, although in some cases stenopaic apparatus was of some value. The hyperbolic, conical, and contact lenses had proved of little use. R. Sattler⁴ states the purposes of surgical treatment to be to arrest the progress of the deformity and to effect improvement of vision, when this has been so reduced as to render the patient helpless. He holds that the simplest and least dangerous method is by the cautious use of the galvanocautery, supplemented, if necessary, by iridectomy or some other operation on the iris. H. Knapp² reports fifteen eyes operated upon with the galvanocautery, in all of which vision was more or less improved. He emphasized these two rules: Never cauterize too deeply, but repeat the operation if necessary. Spare, if possible, the transparency of at least half of the pupillary area. S. D. Risley,² basing his practice upon the idea that conical cornea depended upon disease of the uveal tract, has obtained good results with conservative treatment.

¹ *Klin. Monatsbl. f. Augenheilkunde*, February, 1900.

² *Ibid.*, May, 1900.

³ *Annals of Ophthalmology*, October, 1900.

⁴ *Journal of the American Medical Association*, August 18, 1900.

This includes the use of very carefully selected glasses, prolonged rest of the eyes, the use of mydriatics, sometimes alternated with weak myotic solutions. He regards it as a condition of the anterior segment of the eyeball closely allied to that affecting the posterior portion of the globe in progressive myopia.

The disappearance of headache and tenderness of the eyeball must be secured before the patient can be allowed to use the eyes even with the best of glasses ; and, since the form of the cornea is especially liable to change, the accuracy of the correction by lenses must be frequently tested.

THE IRIS AND PUPIL.

Reactions of the Pupil. The past year has furnished a copious literature regarding the pupillary reactions. To elucidate them, elaborate experiments and anatomical studies have been undertaken ; but to properly approach the consideration of the subject one should remember the extremely wide nerve connections of the iris muscle, the influence of the iris blood-supply, and the enormous physiological variations in the size and mobility of the pupils. The reaction of the pupil is so delicate a reaction that it may occur from the most varied influences starting from the most varied origins. To attempt to draw conclusions from it may be like attempting to draw conclusions from the behavior of an extremely delicate electrometer exposed to a hundred different electrical influences, any one of which is capable of noticeably affecting it. To such an extent is this true that Swanzy¹ says of certain conditions on which the state of the pupils might be expected to shed light : "The condition of the pupils, whether normally contracted or dilated, is of very slight significance or value in the diagnosis either of the position or of the kind of any intracranial lesion."

Those reactions which have to do with the immediate functions of the iris, the regulation of light (reaction to light), and the exclusion of poorly focussed light (contraction with accommodation), are sufficiently constant and overmastering to serve as a basis for practical deductions. It may be noted here that H. Vervoort² concludes that it is with convergence rather than accommodation that contraction of the pupil is really associated ; but other pupillary reactions, however they may be multiplied and studied, can never take the same rank in practical importance.

It is because they are modified light reactions that the Wernicke symptom and the Argyll-Robertson pupil are of such clinical value.

¹ Eye Diseases and Eye Symptoms in their Relation to Organic Diseases of the Brain and Spinal Cord.

² Graef's Archiv f. Ophthalmologie, December, 1899.

The latter has been the subject of special study by W. Harris.¹ He concludes that the loss of pupil contraction to light may be considered an almost certain sign of antecedent syphilis, either congenital or acquired. He has found the symptom in juvenile locomotor ataxia and general paralysis, with evidence of congenital syphilis, and in cases of progressive muscular atrophy, lead poisoning, aortic aneurism, hemiplegia, paraplegia, nuclear ophthalmoplegia, meningitis, and in other conditions which showed no association with locomotor ataxia; but in almost all cases there was obtainable a clear history of syphilis. The loss of the light reflex may be unilateral, but more often the impairment of reaction is simply greater on one side than on the other. Harris reviews the possible anatomical basis for this symptom and concludes that Meynert's fibres have a partial decussation, like the fibres of the optic tracts at the chiasm, that this explains the consensual reaction of the pupil; and that the unilateral or bilateral loss of the light reflex depends on a sclerosis of these fibres on one or both sides rather than upon a nuclear degeneration.

In connection with Harris' finding of loss of the light reflex in many syphilitic but non-ataxic patients, it should be borne in mind that optic nerve atrophy may precede any evidence of ataxia many years, yet the subsequent course of the case will fully justify our classing it as the first evidence of the process that leads to ataxia. In like manner it is claimed by C. O. Hawthorne² that the Argyll-Robertson pupil may be the first symptom of the process and may exist for years before any other symptoms develop. He points out, too, that while optic atrophy is pretty sure to bring the patient under observation, loss of the pupil reflex to light will not occasion any inconvenience and may often have existed a long time when the appearance of other symptoms leads to its discovery. He reports three cases of the Argyll-Robertson symptom, without other evidence of disease, in which previous syphilis seemed quite improbable, and gives other cases of ataxia in which it was the most important early symptom.

DILATATION OF THE PUPIL. The dilatation of the pupil from stimulation of the cerebral cortex has been studied again by J. H. Parsons.³ He finds that this effect is produced only by the stimulation of those parts of the brain which are concerned in eye movements; that the dilatation is the greatest in the pupil of the opposite side; that it is accompanied by the usual effects of stimulating the cervical sympathetic; but while section of the sympathetic lessens the dilatation of the pupil, it does not abolish it. Neither does such section abolish the dilatation produced by stimulation of afferent nerves.

¹ British Medical Journal, September 29, 1900.

² Ibid., March 3, 1900.

³ Ibid., September 15, 1900.

CONTRACTION OF THE PUPIL. The contraction of the pupil which occurs with strong closure of the lids is the subject of numerous recorded observations. The European journals still speak of it as the Westphal-Piltz phenomenon, ignoring the fact that it was fully described four years earlier by H. Gifford, of Omaha. Now Gifford,¹ in a further discussion of it, points out that it had already been described a year before he first observed it by Galassi. Gifford favors the adoption of Galassi's original term "the palpebral reaction" or "lid reaction" of the pupil. He points out that it does not accompany the contraction of the muscles supplied by the facial nerve in the lower part of the face, but only those parts of the orbicularis innervated by fibres of oculo-motor origin—the palpebral portion of the orbicularis muscle. F. Schanz² reports the symptom as very marked in a case of ophthalmoplegia interna. J. Piltz³ reports six cases in which the closure of one eye or attempted closure against resistance caused narrowing of the pupil in the other eye. They were cases of tabes, dementia, and neurasthenia. He also reports a case of complete oculomotor paralysis in which the pupil failed to react to light or accommodation, but narrowed with vigorous closing of the lids; and he reports a case of traumatic paralysis of the iris in which the lid reaction was preserved.

H. Kirchner⁴ reports a case in which the lid reaction was utilized to secure contraction of the pupil in a case of ophthalmoplegia interna. Marked improvement of vision was effected by vigorously closing the eyes several times and repeating this when the pupils became again dilated. I would suggest that the habit of nipping the lids—a sort of restrained closure which gives the name to myopia—may be practised not merely to lessen circles of diffusion by narrowing the palpebral aperture or to change the corneal curve by lid pressure, but also to bring into play the lid reaction of the pupil and by it secure a better reduction of the circles of diffusion than narrowing of the palpebral fissure could give.

EFFECT OF COLORS ON THE PUPILS. The variations of the light reaction of the pupils to different colors has been studied by Abelsdorff,⁵ who sought an objective test for color blindness. He found that in the normal eye, when the light is so reduced that the colors can no longer be recognized, they still cause different degrees of pupil contraction. Red gave a smaller pupil than green or yellow, while yellow gave a smaller pupil than blue; but the attempts to apply these facts to the

¹ Archives of Ophthalmology, March, 1900.

² Annales d'Oculistique. September, 1900.

³ Neurologisches Centralblatt, September 15, 1900.

⁴ Münchener medicin. Wochenschrift, October 30, 1900.

⁵ Archives f. Augenheilkunde, vol. xli., part ii.

detection of color blindness seem to have given no reliable practical result.

PARADOXICAL PUPIL REACTION. Under this name numerous cases have been reported in which the pupil appeared to dilate on exposure to light. Galassi suggested that the dilatation following relaxation of the orbicularis—that is, the dilatation which is the converse of the lid reaction—would explain some of these cases; but in some of the later observations any such influence has been carefully excluded. Silex¹ reports the occurrence of this reaction in a woman who had been injured in the back of the head some years previously. He suggests that it may arise from increased irritability and lessened endurance of the nervous system, affecting specifically the pupillary fibres. When light is thrown into the eye it causes excessive stimulation and rapid exhaustion of the parts concerned in the light reflex, so that the usual tone of the iris sphincter can no longer be maintained.

G. Levinsohn,² who reports a case in a patient suffering with tabes and partial optic atrophy, is also inclined to regard the phenomenon as a result of the weakening of the tone of the pupillary sphincter. In discussing the changes which occur in the pupil after removal of the superior cervical sympathetic ganglion, he points out that, while the irritation of the severed fibres might account for this phenomenon for a few days or weeks, it cannot be accepted to explain its occurrence after months have elapsed since the operation; but an impairment of the sphincter tonus would produce the observed results.

Lauder Brunton³ has noted in one or two cases of alcoholic neuritis a paradoxical reaction with accommodation, the pupil dilating instead of contracting with the effort to accommodate. This accompanied a condition the reverse of the Argyll-Robertson pupil, the pupil reflex to light being especially rapid and extensive. The explanation adopted by Silex, as given above, might apply equally well in this instance; but perhaps all that it is safe to assume from the presence of such an altered reaction is that among the many nerve influences that go to establish the size of the pupil there has been some disturbance of balance changing the resultant, and that the significance of the change in one direction may not be essentially different from the significance of a change in exactly the opposite direction.

OTHER REACTIONS. It has been noticed that when one pupil was strongly illuminated, the other remaining in comparative darkness while both contracted, the contraction was the greater in the eye immediately

¹ *Zeitschrift f. Augenheilkunde*, June, 1900.

² *Klin. Monatsbl. f. Augenheilkunde*, October, 1900.

³ *British Medical Journal*, December 1, 1900.

subjected to the light. A. Pick¹ has noted the condition as being especially marked in cases of the functional psychoses, epilepsy, neurasthenia, etc. He regards it as a constant symptom of these conditions and as connected with hyperæsthesia of the afferent nervous system. Sighicelli² states that in pneumonia the pupils are always dilated and that frequently the greater dilatation is on the side of the affected lung. This he ascribes to excitation of the superior ganglion of the cervical sympathetic through the pulmonary division of the pneumogastric. Failure of the mydriasis is an unfavorable symptom.

Iritis. The occurrence of iritis in connection with infectious inflammation of sinuses adjoining the orbit is indicated by numerous reported cases, and some of these have been cases in which the sinus disease appeared to start from disease in or around one of the teeth. The possibility of iritis arising as a mere reflex of dental irritation is indicated by a case reported by B. L. Millikin.³ The patient's eyes had previously been in excellent condition, and her general health offered no probable cause for the iritis. The right eye suffered from an unmistakable plastic inflammation of the iris. Under the usual treatment the eye recovered in a few weeks, with a single broad synechia. Two months later, however, the patient returned, with tenderness, hyperæmia, photophobia, and lachrymation of the left eye—the symptoms she had previously experienced in the other. These did not yield to treatment, and five days later she was found to be suffering from disease in a left molar tooth. For this she was referred to her dentist, and within two hours after the cleaning out of the cavity of the diseased tooth all ocular symptoms disappeared. Inquiry at this time elicited the fact that at the date of her attack in the other eye she had been suffering from the eruption of a wisdom tooth, which had been a source of irritation for several weeks.

A careful investigation of the general health of eighty-four patients suffering from iritis, reported by Michel,⁴ seems to indicate that it always arises as a symptom of some constitutional condition; but his observations with reference to the frequency of syphilis and rheumatism as such causative conditions are strikingly at variance with the common experience. He found that in 37 per cent. of the cases tuberculosis was the cause; but he included as of tuberculous origin iritis occurring in persons with an hereditary liability to tuberculosis as well as all those who exhibited tubercular lesions elsewhere. In 34 per cent. of the cases he found evidence of chronic nephritis. In 15 per cent. the iritis was

¹ *Neurologische Centralblatt*, October 15, 1900.

² Abstract in *American Journal of Ophthalmology*, June, 1900.

³ *Archives of Ophthalmology*, March, 1900.

⁴ *Münchener medicinische Wochenschrift*, June 19, 1900.

associated with diseases of the circulatory apparatus. In only 6 per cent. was the iritis ascribed to syphilis. In the remaining 8 per cent. various other systemic diseases were recognized. The small proportion of cases ascribed to syphilis may be due partly to accident and partly to the classing as tubercular of cases showing only a family history of tuberculosis or unrelated tubercular lesions, but it will certainly not be accepted as the true proportion in general, since most observers have connected iritis with syphilis in more than half their cases. More than that, it has been clearly established that syphilitic iritis takes certain forms and commonly appears at a particular stage of syphilitic disease, indicating a definite causal relation.

A. Trousseau¹ has observed that the occurrence of iritis in a case of syphilis must be regarded as evidence of severe infection and of especial risk of later manifestations. Of 40 patients affected with syphilitic iritis whose after-history he was able to follow, only 8 remained free from further serious trouble; of the others 9 had lesions outside of the nervous system, 3 suffered from general paralysis, 12 from tabes, 8 from cerebral syphilis, and 2 died from syphilitic lesions. The gravity of the disease in this group of cases is certainly much greater than in the average of cases recognized comparatively early and subjected to efficient treatment, and the 5 cases of which he gives individual histories sustain the view that they were especially severe.

The group of cases commonly classed as rheumatic iritis, and made to include in most statistics about 30 per cent. of all cases, can only be regarded as rheumatic by a very broad interpretation of that term. Many of them are more probably connected with irregular gout, and some arise from various forms of auto-intoxication; but there are cases which are very clearly rheumatic. In some the outbreak occurs with acute articular rheumatism; in others the connection with chronic rheumatism is scarcely less clear. In one reported by H. W. Woodruff² both the patient and her father were subject to chronic articular rheumatism, and her relapses in the iritis accompanied relapses in the rheumatism of the joints.

The connection of iritis with tuberculosis, I think, cannot be admitted on the ground of hereditary tendency. At least the tuberculin test should be applied if no tubercular lesions are evident. W. H. Wilder³ reports a case in which the tuberculin was tried three times, but with negative results, although some of the appearances suggested a tuberculosis of the iris (see page 413).

¹ *Annales d'Oculistique*, May, 1900.

² *Journal of the American Medical Association*, February 9, 1901.

³ *Ophthalmic Record*, January, 1901, p. 48.

IRITIS SENUM. Under this name A. B. Hale¹ describes a group of cases occurring in very old women. The early symptoms were those of conjunctivitis, but after treatment of the conjunctival trouble the patients complained of pain in or about the eye at night. The small size of the normal senile pupil and its comparatively slight reaction tend to conceal the pupillary symptoms of the iritis; but these may be developed by use of one of the weaker mydriatics. Hale mentions particularly homatropin and euphthalmin; but cocaine might be even better, since it produces a relatively greater effect on the senile pupil and is more readily overcome by a myotic. The risk of producing an exacerbation of glaucoma is very slight at eighty years of age and upward—the age of Hale's patients—and, as he says, it should not outweigh the advantage of keeping the iris well under control by atropin should the weaker mydriatics indicate that iritis was present. Hale suggests that this form of iritis may be directly produced by conjunctival catarrh, not by extension of the infection, but as a reflex of the local irritation.

GONORRHOËAL IRITIS. Two cases are reported by R. del Castillo.² In one of them the ocular lesion accompanied arthritis, but in the other it developed after an infected wound of the hand. In both cases there were good recoveries, as there generally are in this form of iritis, although the attack is apt to be violent and at first to produce great interference with vision.

THE TREATMENT OF IRITIS. The observation that iritis depends upon some general disease should be always prominently in mind. I am accustomed to say that it is the one disease of the eye in which general treatment is as important as local measures. Mercury, a specific for syphilitic iritis, is also of value in many non-syphilitic cases. The salicylates have a similar usefulness in rheumatism and in non-rheumatic cases, but the local treatment is not to be underrated. It is still true, as J. H. McCassy³ says, that “atropine is the sheet-anchor in iritis, and to aid it applications of heat and local bleeding are of first importance.”

Exclusion of the pupil, by annular posterior synechia preventing the escape of aqueous from behind the iris, causes its bulging forward—the so-called iris bombé, a condition certain to result in functional loss of the eye, if not in a painful globe, by secondary glaucoma. To prevent such a chain of pathological changes it has been customary to do iridectomy, to provide a channel for the aqueous to pass forward without distending the iris. Fuchs has proposed as a substitute for such iridectomy

¹ Journal of the American Medical Association, June 30, 1900.

² La Clinique Ophthalmologique, May 10, 1900.

³ Medical News, October 6, 1900.

what he calls "transfixion of the iris." From Fuchs' clinic H. Ascheim¹ reports eighteen cases in which the operation has been practised. A Gracfe knife is introduced near the outer margin of the cornea, with its blade parallel to the plane of the iris. It is made to pass through the prominent portion of the iris and to make a counter-puncture near the nasal margin of the cornea. The knife is pushed forward until the widest part of the blade (it must not be a narrow one) reaches the counter-puncture, when it is withdrawn. Thirteen of the operations are reported in detail. In five of them the eyes were aphakic. In the other eight the lens was still present. In the aphakic cases the conditions had followed cataract extraction in three and discission in one, in all of which the successful result was permanent. In the fifth the eye had suffered from sympathetic iritis, and had previously been subjected to iridectomy and a removal of the lens in the endeavor to secure a clear pupil. Transfixion failed to give permanent relief, and, in spite of repeated iridectomies, the eye was lost. Of the eight cases in which the lens remained the relief by transfixion was permanent in four. In the others recurrence of inflammation caused closure of the openings. In judging of the value of transfixion we must bear in mind the unfavorable character of the cases in which it is to be employed, the frequency with which iridectomy fails to give relief, that transfixion is a less formidable operation, and that it does not prevent the subsequent performance of iridectomy in case it fails of its purpose.

Tuberculosis of the Iris. In this disease either the tumor of the tubercular deposit may predominate or the iritis which the tuberculous deposit excites. I refer now not to ordinary iritis occurring in tuberculous or possibly tuberculous subjects, without any tuberculous deposit in the iris, such as has been referred to above, but in certain cases the inflammation excited by small tubercles in the iris is so marked that the other evidences of a deposit may be overlooked at first. In the other class of cases the clinical appearance is rather that of a rapidly growing tumor—the so-called *granuloma* of the iris. There may be two or more such masses, always causing noticeable inflammation, but with the tumor so pronounced that the inflammatory symptoms are naturally ascribed to it. A case of this kind is reported by D. Bernardinis,² which he states is the sixth to be found in Italian literature. The tumor commenced as a gray, oval spot, which, as it increased, became yellowish in color and was hidden by opacity of the adjoining part of the cornea. The eye was enucleated and the patient, aged six years, showed no subsequent evidence of tuberculosis elsewhere. Inoculation

¹ Archives of Ophthalmology, September, 1900.

² Annali d'Ottalmologia, 1900, p. 128.

from the tumor mass produced tuberculosis in the guinea-pig. In tumors of this kind, although the histological structure may be typically tubercular, it is often very difficult to discover the bacillus by cutting and staining methods. Inoculation experiments are essential to demonstrate beyond question the character of the lesion.

Cases in which the iritis was the prominent feature, the tubercular deposits not being at first characteristic, are reported by Nuel and Brandes.¹ In Nuel's case the iritis, in a boy aged seventeen years, commenced with much fibrinous exudate and one yellowish nodule; but two weeks later eight additional nodules or tubercles had developed. In Brandes' case, in a boy aged four years, the diagnosis was complicated by a probability of inherited syphilis.

An experimental study of tuberculin in tuberculosis of the iris has been made by F. Schieck. In most cases the benefit from the tuberculin injections was very striking, but he was not able to cure every case. He points out that recovery may occur without the use of tuberculin. The course of the disease was not, however, unfavorably affected by the treatment, and Schieck urges that it should be tried in all cases of iris tuberculosis before proceeding to the enucleation of the eye.

Schieck² collects from the literature 121 cases of iris tuberculosis and six cases in which the tuberculin treatment had been tried for this disease in the human eye. In these cases the result has been much better than from excision of the nodules, and also decidedly better than the results obtained with experimental tuberculosis in the rabbit. This latter fact he accounts for by the relative scarcity of the tubercle bacilli in the human iris allowing them to be more readily overcome, when the tissues are stimulated to activity by the tuberculin injection.

INTRA-OCULAR TUMORS.

Implantation Cysts of the Anterior Chamber. These have usually been called cysts of the iris, since their nutritive supply is often drawn by something of a pedicle from the iris vessels; but they originate in wounds by which are implanted in the anterior chamber some epithelial elements, as an eyelash, a portion of the epithelium from the skin of the lids, or, perhaps, even some corneal or conjunctival epithelium. Kimpel³ reports a case in which a young woman had received, two and a half years before, a wound of the cornea, with lodgement of one of the cilia in the anterior layer of the iris. The cilium was observed shortly after the injury, and was found when she applied on account

¹ Centralblatt f. prakt. Augenheilkunde, July, 1900, p. 208.

² Graefe's Archiv f. Ophthalmologie, July, 1900.

³ Klinische Monatsbl. f. Augenheilkunde, April, 1900.

of the growth of a cyst, which had reached the size of 2.5 by 3 mm. in diameter. The cyst, however, was separated from the cilium by a strip of normal iris 1 mm. wide, and on extirpation was found to present no elements characteristic of a tumor of dermal origin; but, as Kimpel suggests, it was probable that with the lash a little fragment of corneal epithelium was transplanted into the anterior chamber, from the growth of which the cyst originated.

Wintersteiner,¹ from an anatomical study of fifteen cases, concludes that cysts of this kind are relatively benign, and that the included corneal tissue from which they originate is usually undergoing removal by absorption, the tendency being thus toward spontaneous cure. Cysts of this kind are to be distinguished from the solid tumors produced by implantation of epidermis. A. B. McKee² has presented a case in which the cyst had twice ruptured and reformed. In this case the cyst was supposed to be formed by the separation of the anterior from the posterior layer of the iris, the latter being adherent to the lens capsule. The cyst followed a wound of the eye with scissors, the blade of which penetrated both cornea and iris.

Angioma of the Iris. Two cases of this very rare condition have been examined histologically and reported by A. Alt,³ with clinical histories by J. M. Ray and A. R. Amos. Ray's patient was a woman, aged thirty-nine years, in whose eye a dark spot had been noticed from the time she was five years old, but it had remained stationary until within four or five years, when it began to enlarge; after this the eye became painful, weak, and watery, and later the sight was impaired. When seen by Ray it presented a brownish mass, the size of a coffee bean, filling the upper inner portions of the anterior chamber. As it seemed impossible to remove the growth entirely by iridectomy, the eye was enucleated. Alt found the tumor continuous with the anterior layer of the iris and made up of spindle cells enclosing innumerable cavities lined with endothelium, some of which contained blood. He thinks the one question as to the character of these cavities is between lymph vessels and bloodvessels.

Amos' case was in a boy, aged eleven years, in whose eye the spot had been noticed when he was two or three years of age. When seen the growth occupied most of the nasal half of the anterior chamber. Vision was reduced, but the tension of the eye was normal. The tumor was attached at the iris periphery and was found, on removal of the eye, to extend back into the ciliary body. (See Fig. 77.) The most

¹ Transactions of Heidelberg Ophthalmological Congress, 1900.

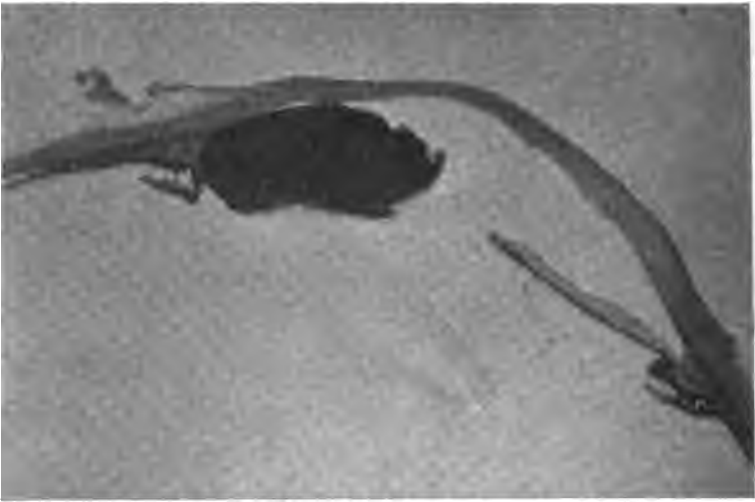
² Ophthalmic Record, June, 1900, p. 304.

³ American Journal of Ophthalmology, December, 1900.

solid portion contained a large number of bloodvessels. The remainder consisted of cavities similar to those found in the other case.

In both of these cases the clinical diagnosis had been sarcoma of the iris, which, of course, justified the removal of the eye; but Alt thinks that the anatomical investigation shows this diagnosis to have been incorrect; that they were rather cases of vascular nævus. The first he would designate as capillary and the second as a cavernous or venous angioma. The possibility of a tumor of the iris being of this character is one to be borne in mind, but I cannot see that either the clinical history or the appearance of such a case would enable the surgeon to distinguish it from sarcoma. Both of these cases, after a period of little

FIG. 77.



Vascular tumor of the iris. (ALT.)

or no visible change, seemed to enter upon a stage in which the tumor progressively increased, and there is no indication of any spontaneous limitation to the increase; so even if one could know that the case were not one of sarcoma it would still be proper to remove the tumor, and if the sight were badly damaged, to accomplish this even by removal of the eyeball.

CAVERNOUS ANGIOMA OF THE CHOROID. A. Wagenmann¹ adds one to the few reported cases of this condition. The patient, a man, aged fifty years, knew that the eye was defective from early childhood, and completely blind from the age of fifteen years, and he presented nævus of the lids. The pupil gave a bright yellow reflex. The eye was enucle-

¹ Graefe's Archiv f. Ophthalmologie, December, 1900.

ated and found to have the retina totally detached, and at its posterior pole to present a vascular tumor of the choroid not very different in structure from that found by Alt in the above-mentioned tumors of the iris.

Here, too, the recognition of the vascular and non-malignant character of the growth would be practically impossible in most cases even were it not hidden by detached retina and hazy media. The difficulty of making a positive diagnosis, even by a microscopical examination of the excised eye, is illustrated by a case reported by C. A. Wood,¹ in which two pathologists were inclined to regard the case as one of sarcoma, while a third supported the view that it was simply a case of plastic inflammation of the uveal tract.

Sarcoma of the Iris. From their position, growths of this kind are likely to be discovered early, and, if relief is promptly sought, it is practicable in a considerable proportion of cases to remove the tumor by iridectomy. Whenever this is true the operation should be done at the earliest possible date. C. A. Wood² did this in the case of a woman, aged forty years, who had noticed the growth for about four months. Microscopical examination showed it to be mainly of the spindle-cell variety, the kind most likely to continue free from recurrence, and in four months following the operation there had been no appearance of recurrence. Of course, the patient in such a case should be informed as to all the dangers that threaten, and advised to submit promptly to enucleation should the growth recur. Sometimes the tumor becomes further developed before it is discovered, or starts so near the ciliary border of the iris that iridectomy is not likely to completely remove it, and enucleation must be done, although the eye may still possess good vision. This was the situation in a case of leucosarcoma of the iris reported by W. W. Griffin.³ The case history went back only three weeks, but the tumor originated in the posterior layers of the iris and had partially displaced the lens when first seen. It also was spindle celled and included regions that had undergone hyaline degeneration. Although rare, a condition like this which threatens the life of the patient and yet is amenable to early operation should be in a general way familiar to every physician.

SARCOMA OF THE CHOROID. The above remark holds with reference to this condition, but in the choroid sarcoma is both more frequent and less likely to meet with early recognition. Cases of early diagnosis, confirmed by microscopical examination, have previously been reported.⁴ Another case of the kind is added by E. Gruening.⁵ The impairment

¹ Ophthalmic Record, May, 1900, p. 248.

² Ibid., December, 1900, p. 630.

³ British Medical Journal, October 13, 1900.

⁴ PROGRESSIVE MEDICINE, June, 1900.

⁵ New York Eye and Ear Infirmary Reports, 1900, p. 3.

of sight had been noticed a few weeks before, and a knob-like mass was detected with the ophthalmoscope, upon the appearance of which the diagnosis was based. Spindle-cell sarcoma proved to be the condition present. Fuchs and Wintersteiner¹ report similar cases, in which the origin of the growth was found to be in the layer of the larger vessels; and in Fuchs' case it started from several independent foci, contradicting his previously expressed view of growth from a single point of origin.

O. Fehr² reports two cases in which the diagnosis was based wholly on the ophthalmoscopic symptoms. In one of them the patient still had normal central vision when first seen, but it fell to 1/v before he would consent to enucleation. Three other cases are reported by Fehr, one of which is interesting as representing a far more advanced stage of the disease. The eye had already been blind for fourteen years, was stony hard, intensely inflamed, and extremely painful, with secondary glaucoma; had been distended until it was 29 mm. in diameter, and presented a bluish, extrabulbar nodule on its posterior surface; yet two years after the enucleation the patient presented no evidence of recurrence or of metastatic extension elsewhere.

Perhaps the chief difficulty in the early ophthalmoscopic diagnosis is to discriminate between sarcoma and exudate, due most frequently to syphilis. A case in which the diagnosis was thus complicated is reported by M. H. Post.³ There was a clear history of previous syphilis, and for a time the administration of mercury seemed to cause some improvement; but this ceased, and large doses of potassium iodide were given without benefit. The removal of the eye showed, as had been suspected from the first, that the appearance was due to sarcoma. In this case the diagnosis was still further complicated by a history of previous tuberculosis; and while in its more typical form tuberculosis of the choroid could not be taken for sarcoma, cases like the one referred to below might readily be confounded with sarcoma.

The greatest uncertainty of diagnosis does not attend either the early stage, where the outlines of the tumor can be clearly seen and its progress watched with the ophthalmoscope, or the later stage in which secondary glaucoma has arisen and the tumor is bursting out of the eyeball; but after developing to a certain extent the growth is liable to cause a general detachment of the retina, with more or less opacity of the vitreous. From the time this has occurred until the increase of intra-ocular tension begins, a diagnosis with any strong degree of probability may be quite impossible. In some cases the examination with direct

¹ Transactions of Heidelberg Ophthalmological Congress, 1900.

² Graefe's Archiv of Ophthalmologie, August, 1900.

³ American Journal of Ophthalmology, August, 1900.

sunlight, as previously suggested,¹ will reveal the tumor even through detached retina and hazy vitreous ; but others will remain obscure until further progress reveals the nature of the case. Thus F. B. Eaton² exhibited a case in which there was some appearance of sarcoma, but with diminished tension of the eyeball. C. A. Oliver³ reports a case which, when first seen, presented diminished tension, with a floating retina and not the slightest indication of a new-growth ; but six months later the patient returned with increased tension and other symptoms of sarcoma, which was found present on removal of the globe. Complete obscurity involved a case reported by D. W. Hunter and G. S. Dixon.⁴ The patient, after a cataract extraction, exhibited symptoms that were ascribed to ordinary wound infection and prolapse of the iris. Operations intended for the relief of such a condition were followed by improvement ; but later the patient returned, with the growth filling the orbit and extending back in the optic nerve in such a way as to make cranial involvement probable.

Scleral puncture to clear up the diagnosis of sarcoma in these obscure cases is reported upon adversely by P. Schultz,⁵ who tried it, obtaining fluid of a reddish-brown color containing granular matter and leucocytes, but no characteristic tumor cells, although the enucleation proved it was a case of round-cell sarcoma. Schultz points out that Hirschberg, who proposed this method, no longer favors it. McReynolds,⁶ who found puncture of assistance, reported the same negative result as to the microscopical examination of the fluid withdrawn, but found it gave a positive indication, by the sense of resistance encountered to the movements of the needle, which seemed notably greater than could be offered by subretinal fluid. A danger of the method which Schultz points out should, however, be borne in mind. The needle track through the sclera offers a direct and favorable avenue for the extension of the tumor beyond the limits of the eyeball. On this account it must be reserved for cases in which enucleation can promptly follow a diagnosis of sarcoma. Demicheri⁷ has suggested the employment of a small electric lamp to illuminate the interior of the eye by holding it close to the sclera. Through the normal sclera the pupil was thus readily illuminated, but in the region of a pigmented sarcoma no such illumination of the pupil was obtained.

The favorable results obtained in Fehr's case is quite exceptional. The usual course of events after the growth has escaped from the sclera

¹ PROGRESSIVE MEDICINE, June, 1899.

² Ophthalmic Record, November, 1900, p. 578.

³ Ibid., June, 1900.

⁴ New York Eye and Ear Infirmary Reports, 1900, p. 10.

⁵ Klinische Monatsbl. f. Augenheilkunde, May, 1900.

⁶ PROGRESSIVE MEDICINE, June, 1900.

⁷ Annales de Ophthalmologia, April, 1900.

is indicated in a case reported by G. E. de Schweinitz and J. D. Steele.¹ The patient had been told there was a growth in his eye and that the eyeball should be removed five years previously; but he refused to have this done until it had reached the stage of glaucoma and extra-scleral nodules; then enucleation was followed by recurrence, and cleaning out of the orbit showed extension along the optic nerve that would make a reappearance of the disease almost certain.

The very slow early development of a sarcoma may make it appear that the growth has started from a new centre subsequent to the removal of the original focus of disease, or that it develops from many centres simultaneously. A case of multiple sarcoma of the skin and eyes, in which it was impossible to locate the original focus of disease, is reported by A. Wagemann.² In this case there was temporary improvement of the ocular conditions under treatment with arsenic and pilocarpin.

Tuberculosis of the choroid commonly takes the form of small tubercles which show as yellowish, rounded spots in the ophthalmoscopic examination, late in the course of acute general tuberculosis; but a different form, more chronic in its course, gives rise to a rounded tumor, almost white in color, which is generally seen imperfectly on account of the opacity of the dioptric media. It is about the only variety of tumor springing from the choroid that is likely to be confounded with sarcoma. A. Tuyt³ reports a case of this kind occurring in a girl, aged seven years, and suffering from tuberculosis in other organs. The redness and excessive lachrymation were first noticed. When seen a few weeks later there was some swelling of the lid, conjunctiva, and general hyperæmia of the globe. The iris was discolored and sluggish and the pupil slightly distorted with posterior synechia. A grayish-yellow reflex was obtained from a part of the fundus, the tension of the eye was slightly elevated, and vision was reduced to a perception of light in the nasal field. There was also an irregular tumor above the cornea. The case remained under observation for twelve months, light perception was lost, the eyeball became very soft, and after eight to ten months shrinking of the globe occurred.

Glioma of the Retina. This is the kind of intra-ocular tumor that would be most constantly confused with sarcoma of the choroid were not the diagnosis between the two almost invariably settled by the age of the patient.

Sarcoma of the choroid is very rare in childhood. Glioma of the retina is confined to the first twelve years of life, and in most cases appears during infancy. Of six cases reported last year the eldest

¹ Ophthalmic Record, March, 1900.

² Deutsch medicinische Wochenschrift, April 19, 1900.

³ Klinische Monatsbl. f. Augenheilkunde, November, 1900.

patient when first seen was four years old, the youngest fourteen months. The universally recognized treatment is excision of the eye at the earliest possible moment, with as much of the optic nerve as can be conveniently taken with it, or, when the tumor is extended beyond the eyeball, the clearing out of the orbit. In two of these six cases there had been no recurrence; but in one of them, reported by G. A. Sulzer,¹ only fourteen months had elapsed, a period entirely too short to demonstrate the permanence of the cure. In the other case, reported by D. Webster,² twelve years had ensued since the removal of the tumor, and the boy was still in every way healthy and well developed.

Fehr³ reports a case in which the tumor had already extended beyond the limits of the eyeball, and within three weeks metastasis had occurred, involving the bones of the opposite orbit. F. M. Wilson and E. S. Thomson⁴ report a case in which enucleation was advised, but at first declined. Three months later, when the eyeball was beginning to bulge, it was enucleated; but a month afterward evidences of recurrence in the orbit were noticed; subsequently the orbit was cleaned out, but the child died, and the base and sides of the brain were found studded with nodules of glioma.

Wilson and Thomson, from an extended study of the literature, including 530 cases, find that metastases have been recorded in 61 cases, to which should be added Fehr's case. The location of the secondary growth was in the cranial and facial bones in 39 cases; brain, including the optic chiasm, 13; lymph glands, 17; parotid gland, 8; other bones, 7; liver, 7; submaxillary gland, ovaries, and kidneys, each 2; spleen, lung, and spine, each 1; location not mentioned, 1.

Some years ago Wintersteiner, from a careful microscopical study of these tumors, concluded that they took their origin from the neuro-epithelial layer of the retina, and he therefore proposed the name neuro-epithelioma to replace glioma. Brown Pusey⁵ concludes that the growth takes its origin from the neuroglia rather than from the neuro-epithelium. On the other hand, F. Seydel⁶ has made a careful microscopical study of an eye removed at an early stage in the development of the glioma, and concludes that a glioma of the retina is a true neuro-epithelioma. He found near the surface of the growth the tumor crowded with the rosette figures described by Wintersteiner, and upon which his neuro-epithelioma theory of these tumors was largely based. Seydel's

¹ Journal of the American Medical Association, November 17, 1900.

² New York Medical Journal, November 8, 1900.

³ Centralblatt f. prakt. Augenheilk., May, 1900.

⁴ Archives of Ophthalmology, January, 1900.

⁵ Philadelphia Medical Journal, November 3, 1900, p. 813.

⁶ Klin. Monatsbl. f. Augenheilk., June, 1900.

case appeared to be bilateral. The right eye was removed and the clinical diagnosis confirmed, but the left eye was allowed to remain, and the tumor appeared to be extending when the patient passed from under observation.

DISEASES OF THE RETINA.

Disease of the Retinal Vessels. The facts hinted at in the saying "A man is as old as his arteries," and the possibility of watching in the retina those vascular changes which so often bring about the termination of life, give to disease of the retinal vessels a far wider interest than would attach merely to their influence upon the function of vision. C. S. Bull¹ discusses the significance of intra-ocular hemorrhage as to the prognosis of life. He finds that in young persons retinal and sub-hyaloid hemorrhages, especially if due to inherited or acquired syphilis, have but slight prognostic importance, while vitreous hemorrhage is more of an indication of general vascular degeneration. In senile angiosclerosis retinal hemorrhages are very frequent and point to the probable occurrence of cerebral apoplexy. In chronic interstitial nephritis and in diabetes retinal hemorrhages are of very grave prognostic significance, and, independently of the presence of exudative retinitis, point to a fatal termination of the disease. The mere presence of thrombosis of the central retinal vein, with hemorrhages in the retina, should arouse suspicion of the existence of albuminuria, and if this suspicion is confirmed by urinary analysis the prognosis in the case is more unfavorable than in those cases in which the hemorrhages do not exist.

G. E. de Schweinitz² finds that hemorrhagic inflammation and exudate in the retina are not the only symptoms there exhibited of general arterial disease. Such disease may be manifested, perhaps, with equal frequency by alterations in the arterial walls, changes in the course and calibre of the veins, and signs of mechanical pressure where veins and arteries cross. Then evidences of vascular disease may be apparent when physical examination does not reveal the signs of endarterial change in the surface vessels of the body generally. Hertel³ points out that the changes of angiosclerosis exist in eyes possessing good vision as well as in those which come to the ophthalmologist because vision is impaired. They are, therefore, in these cases only discoverable by ophthalmoscopical examination; yet, so discovered, they may have quite as much general significance as the changes which attract attention by producing partial blindness.

¹ Medical Record, February 3, 1899.

² Maryland Medical Journal, June, 1900.

³ Transactions of Heidelberg Ophthalmological Congress, 1900.

The exact changes which occur in these cases of retinal disease have during the past year been the subject of special study and discussion. M. Reimar¹ reports the very thorough histological study of a case of hemorrhagic retinitis in which he found the cause of interruption of the blood-current was a proliferating endarteritis. O. Haab² thinks that the accumulation of endothelium in the artery may be taken for an embolus, when the eye is examined post-mortem. Galezowski³ believes that thrombosis due to endarteritis has been the condition really present in cases supposed to be cases of embolism, but in which no probable source for the embolus could be discovered. Among the special causes of such vascular disease Galezowski mentions syphilis, alcoholism, and diabetes.

The share of arterial spasm in causing interruption of the retinal circulation has frequently been the subject of discussion. Regarding it, Sachs⁴ records a very interesting observation. In a case of sudden blindness, with the ophthalmoscopical symptoms of retinal embolism, he notices on one of the arteries a ring of constriction which started in the physiological cup and passed along the artery, off the disk, to where it divided. Constrictions of this kind followed each other sometimes almost immediately, at other times with intervals of half a minute. The distance travelled by the constriction was a half-disk diameter, and to pass over this part of the vessel took it from three to five seconds. The observation was confirmed by Fuchs. It has been claimed that the retinal arteries contain no muscular coat, but this is probably not true of the larger primary branches.

Peri-arteritis so extensive that for a disk diameter beyond the disk margin the arteries were enveloped in snow-white, glistening sheaths is reported by S. Snell.⁵ The patient was found to have hypertrophy of the left ventricle and some albumin and granular casts in the urine.

W. H. Jessop⁶ reported a case in which the symptoms of embolism arose first in the right and two months later in the left eye. There was thickening of the arterial coats, and vascular disease of probable syphilitic origin was regarded as the cause of the obstruction. T. Collins, in discussing the case, called attention to a similar one seen by him in which an interval of eighteen months had elapsed before the involvement of the second eye. He had attributed the trouble to hemorrhage in the optic nerve sheath. The patient had been subject to daily attacks of epistaxis, and Mr. Jessop's patient also had epistaxis.

¹ Archives of Ophthalmology, July, 1900.

² Heidelberg Ophthalmological Congress, 1900.

³ Recueil d'Ophthalmologie, June, 1900.

⁴ Beiträge z. Augenheilkunde, 1900, part xliv.

⁵ Ophthalmic Review, July, 1900, p. 206.

⁶ Transactions of Ophthalmological Society of United Kingdom, June 14, 1900.

G. C. Harlan¹ encountered a case presenting the ophthalmoscopic appearances of embolism of the central retinal artery in a girl, aged fourteen years. Vision had been suddenly lost two days before, and no source for an embolism was discovered. Hemorrhage into the nerve sheath was suggested by de Schweinitz as the cause in this case.

Retinal thrombosis and phlebitis from gonorrhœa are reported by Galezowski.² He points out that such lesions might naturally be expected, since active disease, with the presence of the gonococcus in the heart and great vessels, has been repeatedly demonstrated.

Retinitis. ALBUMINURIC RETINITIS is more closely allied to vascular disease of the retina than to other forms of retinal inflammation, and, like vascular disease, it takes much of its importance from its prognostic significance. That it indicates death within two years is undoubtedly true of most cases; but even in its typical forms such a termination is not invariable. T. R. Pooley³ had a patient under observation, presenting the typical lesions of the fundus, for more than two years, who still remained in good physical condition. The rapidity with which the typical arrangement of exudate about the macula may appear was illustrated in a patient of W. A. Martin,⁴ in whose eye a perfect halo of exudate about the macula was developed in three weeks.

The liability of albuminuric retinitis to end in glaucoma has been previously noted. Within the last year cases of this kind have been reported by R. Jocqs⁵ and by D. Webster and E. S. Thomson.⁶ Such cases may be regarded as an additional illustration of the essentially vascular character of the disease. In Jocqs' case there was a clear history of syphilis. In Webster's case iridectomy was followed by repeated hemorrhages until all light perception was lost, and then the eye, still being painful, was enucleated.

SYPHILITIC RETINITIS is by some writers regarded as always dependent upon choroiditis; but Galezowski,⁷ among 558 cases of syphilitic disease of the eyes, encountered among 15,000 patients, classes 15 as cases of true retinitis. P. T. Vaughan,⁸ among 31 cases of syphilitic disease of the optic nerve and retina, classes 3 as retinitis. G. Nagel,⁹ from an anatomical examination of two cases and a study of the record of similar cases reported by others, concludes that the choroidal and

¹ Ophthalmic Record, December, 1900, p. 626.

² Recueil d'Ophtalmologie, April, 1900.

³ Archives of Ophthalmology, January, 1900, p. 104.

⁴ Ophthalmic Record, July, 1900, p. 342.

⁵ La Clinique Ophtalmologique, July 25, 1900.

⁶ New York Medical Journal, September 1, 1900.

⁷ Transactions Section on Ophthalmology, Thirteenth International Medical Congress.

⁸ New York Medical Journal, September 29, 1900.

⁹ Archives of Ophthalmology, September, 1900.

retinal affections do not always stand in the same relation to each other. He believes it unquestionable that changes in the vessels may usher in syphilitic chorio-retinitis, although it is not proved that these vascular changes are always specific.

RETINITIS PROLIFERANS. This name has been generally accepted as designating the connective tissue masses which are found occasionally extending from the retina out into the vitreous. In most cases their development has been preceded by extensive or repeated hemorrhage from the retinal vessels. So frequently has this been the succession of events that the vitreous growths are frequently regarded as good evidence of previous hemorrhage. Fehr,¹ however, reports a case in which the process of development of the vitreous opacity was closely observed throughout, and hemorrhage was found to play no part in it. He believes that the process depends on disease of the retinal vessels, which would also account for the hemorrhage.

Detachment of the Retina. This condition is a centre of unsolved problems in ophthalmic pathology and therapeutics, and therefore continues to receive more attention than its relative importance might seem to justify. L. Gabler² saw 120 cases among 76,000 patients in Budapest. It was nearly always associated with high myopia. Of these 44 cases were treated by various methods, among which 4 improved by scleral puncture and 5 after iridectomy, but none of these is spoken of as being cured. A case of recovery which remained complete after three months is reported by S. Theobald.³ The detachment occurred in a highly myopic eye, without traumatism, and was treated early by prolonged rest in bed and the administration of pilocarpine.

G. E. de Schweinitz⁴ reports a case of rapid cure under rest and the administration of sodium iodide. The eye continued in good condition a year later. In another patient with myopia and no history of traumatism, and who was treated early, rest in bed, with the hypodermic use of pilocarpine and the internal administration of sodium salicylate, was followed by replacement of the retina in three days. The patient was kept in bed for a week and confined to the house for nearly a week longer. The restoration continued complete. Following it there developed the appearances shown in Fig. 78, closely resembling those of striate retinitis. The line shown marks what was the boundary of the detached portion of the retina.

A rare case of retinal detachment associated with iridocyclitis is reported by Velhagen.⁵ On account of the inflammatory condition the

¹ Centralblatt f. prak. Augenheilkunde, July, 1900.

² Wochenschrift f. Therap. und Hygiene des Auges, March 8, 1900.

³ Archives of Ophthalmology, May, 1900.

⁴ Ophthalmic Record, August, 1900.

⁵ Graefe's Archiv f. Ophthalmologie, March, 1900.

eye was enucleated, hardened in Müller's fluid, and divided by an equatorial section. The anterior half of the globe showed no sign of the retina. It was found in a rounded mass of brownish-red color lying in the posterior portion of the globe. Velhagen points out that this

FIG. 78.



Striate appearance of the retina following detachment. (DE SCHWEINITZ)

constitutes a striking exception to the usual arrangement of a totally detached retina, which is funnel-shaped, with its attachments at the optic disk and ora serrata, and that such a rounded mass might under certain conditions readily be taken for an intra-ocular new-growth.

DISEASES OF THE OPTIC NERVE.

Optic Neuritis. The importance of optic neuritis comes largely from its value in diagnosis. While it tells little of the exact location or character of the disease process with which it is associated, the positive way in which it demonstrates the presence of some grave organic disease is

most valuable. In a large proportion of cases other symptoms may be found that will help to locate the trouble when once it has been clearly proved that serious disease is somewhere present to be located.

L. Buchanan¹ believes that the existence of neuritis or post-neuritic atrophy affecting both eyes in a young person and accompanied by even the very moderate enlargement of the cervical glands is an important indication of meningitis or a tubercular growth in the brain. He reports a case in which the fact of failure of vision occurring from this cause first drew attention to the serious condition of the patient.

The connection of optic neuritis with cerebral disease is well illustrated by a study of 100 cases, in which the neuritis affected both eyes and was attended by headache, by R. T. Williamson and E. Roberts.² Among these were 60 fatal cases, of which necropsy verified the diagnosis of brain tumor in 27; 2 showed distention of the ventricles, with fluid, yet no tumor; 2 were of cerebral abscess and 2 were of tuberculous meningitis, while in 27 in which no necropsy could be made the majority of deaths were undoubtedly due to brain tumor. Of the whole series 29 cases seem to have recovered from the general disease, 8 of them with blindness and 3 with impaired vision. In 2 cases the termination was still uncertain.

But along with the above instances of cerebral disease there were 3 fatal cases of chronic interstitial nephritis. The following conditions each caused 1 fatal case: Ulcerative endocarditis, hemorrhagic purpura, and Hennoch's purpura; and there were 6 non-fatal cases of probably syphilitic neuritis; 3 of lead-poisoning and 3 of chlorosis, with cerebral symptoms. A. Engelhardt³ reports a case of chlorosis which was allowed to go on to a fatal termination, with the diagnosis of brain tumor, although the patient spent the larger part of her last year in a hospital. The necropsy revealed no tumor, but evidence of extreme anæmia. Death was due to inanition. Systematic forced feeding had not been attempted on account of the error in diagnosis.

The lesson cannot be too often or too strongly enforced that neuritis only indicates that a grave disease is present, not its location; not even that in a general way it will always be found within the cranium. There can be little doubt that the frequency of neuritis in connection with other than cranial disease has been underestimated. This is illustrated by the fact that, after excluding all cases presenting intra-cranial complications, W. Ulthoff⁴ was able to collect 253 in which optic neuritis arose in connection with different infectious diseases. The numbers

¹ Edinburgh Medical Journal, May, 1900.

² Lancet, May 12, 1900.

³ Münchener medicinische Wochenschrift, September 4, 1900.

⁴ Transactions of Heidelberg Ophthalmological Congress, 1900.

due to various causes were: influenza, 72; syphilis, 60; rheumatism, 37; malaria, 17; typhoid, 17; measles, 9; diphtheria, 6; smallpox, 6; beri-beri, 5; typhus, 5; erysipelas, 3; scarlatina, 3; gonorrhœa, 2, and in connection with polyneuritis, 7. Uhthoff includes in this collection cases of so-called retrobulbar neuritis with those of typical choked disk; but the number of the latter class is quite sufficient to make the recognition of their origin of great practical importance.

A possible source of unwarranted deductions to be borne in mind, in connection with neuritis, is the class of cases in which the appearances of inflammation are simulated as a congenital anomaly of the disk and retina. I have encountered a case of this kind¹ in which the continuance of the ophthalmoscopic picture of neuritis, absolutely without change for over four months, with normal vision, normal visual fields, and complete absence of general symptoms were required to convince those who saw it that the case was not really one of optic neuritis.

POST-NEURITIC ATROPHY. The diagnostic significance of neuritis attaches, of course, to post-neuritic atrophy. H. Dor² reports a case of such optic atrophy following mumps. The patient, a young man, had suffered severely from the original disease, being confined to the infirmary for twenty-seven days with it. His attack had occurred in an epidemic that broke out in the barracks where he was undergoing military service. Dor also collects from the French literature several other cases showing evidences of inflammation of the optic nerve and adjoining parts of the retina due to the same cause. The patients were all young men in military service. Most of them recovered good vision, but in at least one other case there was great permanent impairment of vision.

Double post-neuritic atrophy is reported by Randall,³ due apparently to otitic thrombosis, although the attack had been regarded as one of meningitis. Here the optic nerve condition seemed to prove the serious character of the disease, the exact location of which rested on the other symptoms, as pain, tenderness, swelling, and suppuration of one ear. Last year I referred to a case of optic neuritis due to thrombosis of the sigmoid sinus from ear disease. J. P. Maxwell⁴ reports a case in which optic neuritis of one eye developed in connection with mastoid suppuration of the same side. The only other symptom of intracranial disease was headache of that side of the head, and all the symptoms rapidly disappeared after free opening of the mastoid cells and clearing out of the middle ear.

¹ Ophthalmic Record, December, 1900, p. 640.

² Revue Générale d'Ophthalmologie, August, 1900.

³ Ophthalmic Record, March, 1900, p. 147.

⁴ British Medical Journal, May 19, 1900.

The manner in which intracranial disease produces optic neuritis is still unknown. Merz¹ reports the results of experiments on dogs, which he thinks show that increased intracranial pressure, if continuous, produces choked disk. He thinks that the result is brought about both by pressure in the venous sinuses and by compression of the vessels which enter the optic nerve by fluid collected in the nerve sheath.

Hereditary Disease of the Optic Nerve. H. F. Hansell² reports a case of double retrobulbar neuritis occurring in a man, aged fifty-six years, whose oldest brother lost his sight at thirty-five, while another brother had been similarly affected at fifty years, and several aunts and uncles on his mother's side had become nearly blind in adult life. In Hansell's case vision was reduced to 10/cc and there was absolute central scotoma. Vision seemed to have been lost in a single night, and the ophthalmoscope showed a low grade of neuritis. Subsequently some optic atrophy occurred, but the peripheral field was not impaired, and neither in the patient nor the other members of his family did the failure of vision continue progressive.

C. S. Hawkes³ reports hereditary optic atrophy in two families, followed through four generations. In a family of four boys and one girl two of the boys became blind at the age of thirty years, the history of the other two being unknown. The girl married and had nine children; five daughters were unaffected, two of the sons becoming blind at fifteen and forty-eight years. One of the daughters married and had five children—two male, both blind; one female blind, and two unaffected. In the other family there were three children—two boys blind, and a girl who had four sons, all blind, and a daughter not affected, but who in turn had two sons, both blind.

P. Hormuth⁴ contributes a general study of the literature of the subject. He brings together 284 cases in 65 families, but only 110 of these cases have come under the immediate observation of their reporters. The disease has appeared as early as the sixth year and as late as the sixty-seventh, but most frequently at puberty or between forty and fifty years. Of the 29 women who suffered with it about one-fourth were attacked during this latter period. The impairment of vision reaches its maximum within four to ten weeks after it is first noticed, and after that continues stationary. The ophthalmoscopical symptoms are at first those of slight neuritis and later of partial atrophy. The phenomenon of hereditary transmission to males through the females of a family is strikingly manifest in this disease. He finds that most of

¹ Archives f. Augenheilkunde, 4, 1900.

² Transactions of American Ophthalmological Society, 1900.

³ Australasian Medical Gazette, June 20, 1900.

⁴ Beiträge zur Augenheilkunde, 1900, Heft 42.

the families present evidence of a neuropathic organization, and that there is some tendency for the disease to disappear by lessened fertility of the females in successive generations.

TOXIC AMBLYOPIAS.

Pathology and Classification. Toxic optic neuritis is the term largely used to designate these amblyopias, although it is clear that at least some of them depend upon pathological processes quite different from those of classic inflammations. A general discussion of their pathology and classification took place before the Section on Ophthalmology of the Thirteenth International Medical Congress. It was opened by exhaustive papers by Uhthoff and Nuel, who held somewhat opposing views as to the pathology of these conditions. W. Uhthoff¹ has examined microscopically the optic nerve in eleven cases of alcohol and tobacco amblyopia, and has not in any one failed to find evidence of an interstitial neuritis; and he urges that cases of this kind are numbered by hundreds where other varieties of toxic amblyopias are numbered by units, and although admitting as possible a different pathology for some of the other varieties, he regards it as not proved.

J. P. Nuel² bases his argument largely on the changes produced on the division of the optic nerve in dogs and rabbits and upon the results of the administration of quinine and filix mas to dogs. He holds that the primary change is a poisoning of the nerve fibres themselves, and that the changes in the other parts of the nerve should be regarded as secondary; that the lesion is essentially a parenchymatous, not an interstitial inflammation.

These views are not necessarily antagonistic or mutually exclusive. This appears when we consider the essentially different clinical manifestations of amblyopia due to tobacco and alcohol from those of the amblyopia due to quinine or male fern. Furthermore, Uhthoff argues from post-mortem appearances in advanced cases of long standing, while Nuel bases his deductions on what is discovered of the earlier changes by experiments. G. Sourdille³ suggests as a ground of reconciliation that both the nerve fibres and the supporting tissues are affected by the poison, and that in acute poisoning it is the former that suffers most, while if the toxic influence be long continued it causes more marked changes in the interstitial substance. Siegrist,⁴ who contributes two observations as to the pathological anatomy of alcohol amblyopia, agrees

¹ Klin. Monatsbl. f. Augenheilkunde, August, 1900.

² Annales d'Oculistique, August, 1900.

³ La Clinique Ophtalmologique, October 10, 1900.

⁴ Archiv f. Augenheilkunde, March, 1900.

in the main with Uhthoff, but admits the difficulty of supposing alcohol to act thus in optic neuritis, when in multiple neuritis it is the nerve fibres that are first attacked.

Uhthoff's grouping of these amblyopias will in the main be accepted as scientific and convenient. He holds that they may arise from either external poisons or by auto-intoxication. In the group with alcohol and tobacco amblyopia he includes the conditions produced by carbon bisulphide, arsenic, iodoform, stramonium, and cannabis indica. In this group the leading symptoms are retrobulbar neuritis, central scotoma, and a normal periphery to the visual field. In a second group he places with quinine amblyopia those produced by salicylic acid, filix mas, and pomegranate. These are marked by pallor of the whole optic disk, narrowing of the retinal vessels, contraction of the visual field, and absence of central scotoma. To lead-poisoning he gives a position intermediate between the above groups. The amblyopias due to nitrobenzol, aniline compounds, serpent venom, and associated with pellagra, he thinks have not been sufficiently studied and defined for present classification.

The auto-intoxications to which he refers are associated with diabetes (in which the amblyopia is clearly of the same character as that produced by tobacco), gout, uræmia, cancer, chlorosis, pregnancy, the puerperal condition, and lactation.

In the discussion above referred to Rochon Duvigneaud¹ reported one case of amblyopia associated with a cancerous cachexia, but also with extreme anæmia. Santos Fernandez reported toxic amblyopia from defective intestinal alimentation.

Quinine Amblyopia. The pathology of this condition has been elucidated chiefly by experimental study. Another such investigation of it has been made by A. Drualt.² He finds the primary lesion to be in the nucleus of the ganglion cells of the retina, where the change can be detected ten hours after the administration of the drug. This change, he thinks, is not explained by the changes in the circulation, but is due to a direct toxic action of the quinine upon the cells. It is possible, however, that the circulatory changes aid slightly in producing the degeneration. Exposure to light does not hasten the degeneration of the cells. Previous section of the optic nerve noticeably retards it. This action Drualt makes the subject of a special communication.³ If the drug be given six days after the division of one optic nerve and the animal killed two days later, the ganglion cells on the side of the divided nerve are found not diminished in number and showing only a moderate

¹ *Annales d'Oculistique*, August, 1900, p. 146.

² *Recherches sur la Pathogenie de l'Amaurose Quinine*, Paris, 1900.

³ *Archives d'Ophthalmologie*, July, 1900.

degree of chromatolysis, while in the other eye their destruction is about complete. In some way the disturbance caused by the nerve section removes the liability to the toxic influence of the quinine.

The importance of idiosyncrasy in producing quinine blindness is commented upon by A. Alt¹ in reporting his first undoubted case of quinine amblyopia seen in many years of practice in a malarial, quinine-consuming country. The extreme to which an idiosyncrasy can reach in this matter of susceptibility to quinine is illustrated by a case recorded by F. W. Bock.² An army officer took three one-grain pills at intervals of an hour, which caused an erysipelatous erythema, delirium, and signs of collapse. He had been similarly affected on previous occasions, and this time it took him four weeks to recover from the effects of the drug.

Alt suggests, however, that some of the cases of obscure optic atrophy that he has encountered may really be cases of quinine blindness. H. Moulton³ follows up this suggestion by reporting two cases, brought to him years afterward, each presenting small retinal vessels and pale optic disks, in which careful inquiry elicited the fact that at the age of four years the children had been blind for a few days after taking large doses of quinine. When seen at the ages of eight and nineteen years their visual fields still remained contracted. Another case of quinine amblyopia in a child is reported by M. Coplan.⁴ A boy, three years old, suffering from quotidian malarial fever, was given 30 grains of quinia sulphate in twenty-four hours, when he complained of inability to see. Vision was recovered gradually, and by the fifth day was almost normal.

A symptom of quinine blindness not previously recorded is mentioned by Alt. After himself taking 60 grains of quinia muriate inside of an hour he experienced green vision, everything appearing of a bright emerald hue.

Exceptional Toxic Amblyopias. A case of amblyopia due to *excessive tea-drinking* is reported by R. W. Henry,⁵ who also gives an account of a case previously reported by K. Campbell. This latter patient, a man, aged forty-six years, had been a smoker and took one glass of beer per day, when amblyopia with central scotoma developed. The use of tobacco and beer was stopped and for two months he was treated without improvement; then it was found that he took twelve cups of strong tea daily. This was interdicted and the tobacco and beer allowed in their former amounts, and in four months vision had risen from 3/LX to 6/IX.

¹ American Journal of Ophthalmology, January, 1901.

² Merck's Archiv, August, 1900.

³ American Journal of Ophthalmology, February, 1901.

⁴ Journal of the American Medical Association, May 26, 1900.

⁵ Ophthalmic Review, December, 1900.

Henry's case was of a man, aged fifty-seven years, who never used tobacco and had never taken more than a pint of beer a day, but who "was always drinking strong tea." His vision had been reduced to 6/VIII partly, there was a small central scotoma formed, and he complained greatly of a dazzling mist. Tea was absolutely forbidden, sodium bicarbonate and nux vomica were given for dyspepsia, and in three months vision was normal in every way. In this connection it may be well to remember that auto-intoxication from impaired digestion and assimilation has been suggested as the basis of various toxic amblyopias.

The effects upon the eye of poisoning by *illuminating gas* have been studied by Purtscher,¹ who reports a new case and reviews the literature of the subject. The majority of cases terminate fatally, but among the lighter ones eye lesions are not rare. Among 20 such he finds 13 cases with positive statements regarding ocular changes, though 3 of these were fatal. In 3 cases there was exophthalmos, in 3 squint, in 1 paralysis of accommodation; in 4 the pupils were altered, one of them presenting the paradoxical pupil reaction; in 3 cases central acuteness of vision was affected, and in 3 contraction of the visual field occurred. In several cases there were alterations of the retinal vessels. In Purtscher's case the patient was totally blind for ten days; then followed restoration of some vision in the right field, with improvement to normal central vision, indicating that the case was probably one of double homonymous hemianopsia, with partial recovery on one side.

In the mass of cases the damage seems principally to fall upon the cerebral portions of the visual apparatus rather than upon the eye or the intra-orbital portion of the optic nerve. This was clearly so in a case reported by H. Friedenwald,² and not included among Purtscher's references. The patient had recovered consciousness within a few hours, but when seen several days later had been unable to read since the poisoning. Examination of the field of vision showed left hemianopsia, complete in the upper sector of the left field and partial in the lower part. The boundary of the blind portion passed a little to the left of the fixation-point. The sector of complete blindness was less than a quarter of the field, but it extended some twenty degrees below the fixation-point.

An additional case of poisoning by *Jamaica ginger* is reported by E. Stieren.³ The drug was taken about noon, and at 3 P. M. the man awoke totally blind. He was seen at 6 P. M., presenting no ophthalmoscopical change except slight blurring of the disk from retinal oedema. He had already recovered ability to see the moving hand. Active diaphoresis

¹ Centralblatt f. prakt. Augenheilkunde, August, 1900.

² Archives of Ophthalmology, May, 1900.

³ Journal of the American Medical Association, January 5, 1901.

and catharsis were resorted to. The next morning he could count the fingers at ten inches. For two days the hypodermic use of pilocarpine and the internal administration of calomel were continued, and then followed by the use of potassium iodide. In five days vision had improved to 20/xx with a correcting lens, and there remained no scotoma and no narrowing of the field. The recovery continued complete. Two cases are reported by J. Dunn¹ in which, as in most of the previously reported cases, the patients were not seen until some weeks after the poisoning, and there remained permanent impairment of vision.

In the account of this form of amblyopia last year I pointed out that "the points of resemblance to *methyl alcohol amblyopia* would justify a careful investigation to determine whether this drug is used in the cheap essences of Jamaica ginger."

H. Harlan,² with the report of two cases of this form of poisoning which ended in partial and complete blindness, publishes the report of a chemist of a careful examination of specimens of the kind of "essence" of ginger used. This shows that the menstruum employed was one-fourth ethylic alcohol and three-fourths methylic alcohol, and was very poor in ginger. It is therefore altogether probable that amblyopia heretofore credited to Jamaica ginger is nothing more or less than amblyopia due to wood alcohol. It is especially significant that the majority of these cases have occurred in the region around Baltimore, where this wood alcohol "essence" of ginger is made.

Amblyopia due to methyl alcohol has been studied experimentally by Birch-Hirschfeld³ in rabbits and chickens. He finds the primary lesion to be in the retinal ganglion cells, and this is followed by degeneration of the fibres in certain portions of the optic nerve.

Amblyopia from poisoning by *santonin* is reported by Inouye.⁴ The patient, a man, aged thirty-three years, had at first noticed yellow vision, and at the end of three days suffered from a retrobulbar optic neuritis on the right side. The dose taken was apparently slightly less than 2 grains of santonin, but yellow vision was very marked, and no other probable cause of retrobulbar neuritis could be discovered.

DISEASES OF THE VISUAL TRACTS AND CENTRES.

Homonymous Hemianopsia. This symptom is chiefly of significance because of the indication it gives of the locality of the lesion producing it,

¹ Virginia Medical Semi-Monthly, January 25, 1901.

² Ophthalmic Record, February, 1901.

³ Transactions of Heidelberg Ophthalmological Congress, 1900.

⁴ La Clinique Ophthalmologique, November 10, 1900.

not because it throws light upon the character of the pathological process. In an elaborate discussion of it H. Schmidt-Rimpler¹ points out that homonymous hemianopsia occurs in hysteria and neurasthenia only in connection with contraction of the field, or amblyopia. When due to a lesion that involves the chiasm it is irregular in form or complicated by amblyopia of one eye, and such a location is indicated by accompanying palsies of the eye muscles. In lesions of the optic tract the fields are usually similarly limited, with good central vision. Such lesions are accompanied with inaction of the pupil to light thrown on the blind half of the retina. A lesion of the internal capsule may cause hemianopsia with hemiplegia. Motor palsies point to the anterior and sensory to the posterior portion. Lesions of the cortical centres may be preceded by visual hallucinations, but no history of such an occurrence may be obtainable. Pure hemianopsias unattended by other cerebral symptoms, and especially if partial—that is, involving less than half the field of vision—point strongly to a lesion of the cortex or of the optic radiations near the cortex. Transient hemianopsia may arise as a distinct symptom of focal lesions quite outside of the visual tracts and centres; or in purely functional disease, as migraine. In hemianopsia the prognosis is favorable as regards complete blindness. Even when double homonymous hemianopsia occurs, central vision is retained or in a large degree recovered in a short time.

Most of the above generalizations might be illustrated from the literature of the past year. M. W. Zimmerman² reports a case of left homonymous hemianopsia with hysteria, but it was accompanied with marked disturbance of the limits of the field, both for form and color, and extravagant hallucinations. S. M. Burnett³ reports a case of similar sector defects in the two fields, probably due to a lesion of the right cortical centre. Jacqueau⁴ reports a case of double homonymous hemianopsia, with the retention of a very small central field. He also reports a case of double blindness in which no such central field was retained, but the nature of the latter case is not clear. S. D. Risley⁵ records a case of right homonymous hemianopsia accompanied by alexia, partial visual aphasia, and amnesia, following an attack of influenza. The patient subsequently improved, but experienced partial relapses when depressed in general health. At the end of two and a quarter years the hemianopsia continued, but there had been no further contraction of the remaining fields.

¹ *Annals of Ophthalmology*, April, 1900.

² *Ophthalmic Record*, January, 1901, p. 41.

³ *Transactions of American Ophthalmological Society*, 1900.

⁴ *La Clinique Ophthalmologique*, September 10, 1900.

⁵ *American Journal of Ophthalmology*, February, 1901.

Liepmann¹ has made an interesting observation regarding the judgment of relative distances in patients suffering with hemianopsia. He found that such patients when required to divide a horizontal line into equal parts made the part on the blind side the smaller, or at least in 600 trials this mistake was made in more than 80 per cent. A vertical line they could divide quite correctly. Liepmann explains this phenomenon by supposing that with hemianopsia there occurs a change in the innervation of the muscles that turn the eye toward the blind side. Because the sensory impulse inviting movement in that direction is reduced to a minimum such movements are executed only by a greater conscious effort, and this greater effort to turn the eyes toward the blind side leads to an overestimate of the distance they are turned from the middle point.

The loss of a sense of the relative positions of objects has frequently been noticed in connection with hemianopsia. R. Touche² reports a case of right hemianopsia in which what he terms the topographic memory was completely abolished. The patient had suffered from an attack of apoplexy. There was conjugate deviation of the eyes and head to the left and inability to turn them to the right beyond the median line. The autopsy showed an extensive area of softening in the right parietal and temporal lobes. In the left brain almost the whole temporo-occipital lobe was softened. Touche believes that in connection with previously reported cases he has demonstrated that topographic memory is seated in the left fusiform lobule.

Rarer Forms of Hemianopsia. TYPICAL NASAL HEMIANOPSIA should arise from injury of the fibres that do not cross at the optic chiasm. It is scarcely possible that these should be injured, without injury of any other portion of the optic nerve or tracts, except by a lesion just opposite the chiasm, where they are a little removed from the fibres that have entered the chiasm to cross to the other side. Double nasal hemianopsia would assume a lesion involving both sides of the chiasm, or, in the absence of involvement of other parts of the tracts, two lesions symmetrically placed. That such lesions might simultaneously occur is possible, especially from traumatism. The nerve tracts in question lie in close proximity to the prominent inner roots of the anterior clinoid processes of the sphenoid, the outer walls of the optic foramina.

S. M. Burnett³ reports the case of a healthy man, aged forty years, who fell from a street car, striking his forehead against the ground,

¹ Berliner klin. Wochenschrift, September 17, 1900.

² Annales d'Oculistique, September, 1900.

³ Archives of Ophthalmology, January, 1900.

and noticed soon after that vision was impaired in the right eye. When seen nine days later the nasal half of the field was entirely lacking, the retinal veins were tortuous, the outline of the disk indistinct, and the retina swollen around it. Three months later the visual field of the left eye became similarly impaired and the ophthalmoscope showed the same change in the disk and retina. Subsequently the optic disks became whiter, and central vision, which had never been perfect, remained permanently impaired, especially in the left eye. The boundary between the blind and seeing fields passed somewhat to the blind side of the fixation-point, as in ordinary hemianopsia. The patient suffered from intense headaches, chromatopsic illusions, and finally aphasia, agraphia, and pyæmia. He died within three years after the injury, but the intracranial lesions were not ascertained. Burnett thinks that a hemorrhage at the outer side of the right optic nerve would readily account for the hemianopsia of that eye. The symptom in the left might be ascribed to hemorrhage or exudate making its way around the chiasm and affecting chiefly the temporal fibres on the left side.

ALTITUDINAL HEMIANOPSIA. G. A. Critchett¹ has reported a case of loss of the lower half of each visual field from a bullet wound of the occipital lobe. The wound of entrance was on the right side, one and a half inches below and slightly behind the parietal eminence. The wound of exit was one-half inch to the left of the middle line and two inches above the occipital protuberance. Sight was lost instantly, although consciousness was retained for half an hour. Two weeks later vision began to return in the upper halves of the fields, and improved until central vision in each eye was normal. The boundary between the blind and seeing portions of the field was irregular. In this case apparently one-half of the cortical centre on each side was destroyed and the other portion temporarily disabled; but with time the latter fully recovered its function, while the part destroyed caused a corresponding permanent limitation of the field of vision. It would be extremely interesting to know just what part of the cortex lining the calcarine fissure had been permanently damaged. It would go far toward showing the relation of the lower and upper halves of the retina to different parts of the cortex.

TEMPORARY HEMIANOPSIA. Temporary left hemianopsia from injury of the exterior portion of the right occipital lobe occurred in a case seen by H. W. Page.² Improvement of the field began in a very few days, and after four months, although the fields still showed some

¹ Transactions of Ophthalmological Society of United Kingdom, January 31, 1901.

² Lancet, January 19, 1901.

irregular concentric contraction, they had entirely lost their hemianopic character.

FIELD IN ACROMEGALY. Impairment of the visual field from pressure upon the chiasm would naturally be expected in acromegaly, and some form of visual disturbance has been noticed in the majority of cases reported. Where the pressure from the enlarging pituitary body is confined strictly to the chiasm, typical bitemporal hemianopsia—that is, symmetrical defects of the temporal fields of greater or lesser extent—arise; but where the pressure affects one tract more than the other the resulting defect of the field must be correspondingly asymmetrical. Thus in a case reported by F. M. Pope and A. V. Clarke¹ there was bitemporal hemianopsia, but the field was more contracted for the left eye.

W. A. Holden² found that while bitemporal hemianopsia had occurred in less than 50 per cent. of cases, there had been concentric contraction of the visual field with diminution of central acuteness in over 50 per cent. Perhaps the slowly progressive character of the limitation of the field is more characteristic of the condition than any special form of limitation. The visual disturbances are not usually noticed until years after the enlargement of the extremities. Holden, from the anatomical examination of three cases, concludes that the order of involvement is commonly, first, pressure on the posterior part of the chiasm, and then flattening and pressing upward of the posterior and middle portions which may be separated from the anterior portion that lies somewhat protected by the bone until a later period; but finally the chiasm may be completely severed.

Hysterical Blindness. It has usually heretofore been regarded as impossible to differentiate this condition from pretended blindness—malingering. Probably in a large proportion of cases it always will be impossible to make such a distinction. But G. C. Harlan³ reports a case in which the accompanying evidence of hysteria and the subsequent recovery of vision established the diagnosis of hysterical blindness in one eye, but the objective tests and prisms indicated that it was a true blindness. With prisms placed before the alleged blind eye there occurred no movement to avoid diplopia, and no movement of recovery when the prism was removed.

A most remarkable case of blindness of similar character is reported by G. F. Libby.⁴ The patient was believed to be blind in the right eye or to possess only perception of moving shadows. In childhood

¹ British Medical Journal, December 1, 1900.

² Archives of Neurology and Psychopathology, vol. ii.

³ Journal of Nervous and Mental Disease, April, 1900.

⁴ Ophthalmic Record, November, 1900.

she had developed the habit of turning the head so as to bring the objects within the field of vision for the left eye. Several times, on getting a foreign body in the left eye, which compelled her to keep it closed, she had been quite blind, and the eye had been pronounced hopelessly blind by professional advisers. At the age of fifty-three she was attacked with hemiplegia and aphasia, and three weeks later was amazed to discover that she could see with the right eye. When seen a year later vision in this eye was 6/x, and both eyes appeared normal except slight haziness in the vitreous of the one which had previously been blind.

It would be far more difficult to credit the correctness of such a history if we were not familiar with the functional suppression of one eye in the use of monocular optical instruments like the ophthalmoscope and microscope; but this physiological phenomenon, with which many are familiar, might readily be conceived as closely related to pathological conditions like those above described. It seems only necessary to suppose a difference in the degree and duration of suppression, and a difference in the causes operative in producing it, to account for such cases without any assumption of conscious deception.

DISEASES OF THE CRYSTALLINE LENS.

Cure of Cataract without Operation. Certain observations bearing upon the growth and nutrition of the crystalline lens which have been published within the last year are of considerable interest and importance. While cataract extraction is to-day one of the most brilliant and certain of surgical operations, patients and that portion of the profession who do not operate for cataract persistently cling to the belief that prevention, or cure without operation, would be a greater achievement. This belief renders them a prey to the claims made in behalf of this or that method for causing the "absorption" of cataract. The most rapidly developing senile cataract I have seen in the last year so progressed under the persistent application of the most widely and boastingly advertised drug for the cure of cataract by "absorption." Probably a more general understanding regarding the few cases in which some sort of spontaneous recovery from cataract occurs would leave the profession at least less subject to the wiles of the promoters of these alleged "cures."

W. L. Pyle¹ reports a case of spontaneous disappearance of senile cataract, and carefully considers the previous reports of similar cases. He divides these into five classes: (1) Those in which there is absorp-

¹ Philadelphia Medical Journal, March 17, 1900.

tion after spontaneous rupture of the capsule ; (2) cases of spontaneous dislocation of the opaque lens ; (3) cases of absorption of the cortex and sinking of the nucleus, so that it no longer obstructs the pupil ; (4) complete spontaneous resorption of both nucleus and cortex ; (5) spontaneous disappearance of incipient cataract without degenerative changes.

That developed cataract may be spontaneously removed there can be no question, but it is equally certain that the proportion of cases in which such removal occurs is extremely small, perhaps 1 in 500. It is also certain that for senile cataract nature's methods of effecting removal without extraction are as yet far more tedious, painful, or dangerous than the operation for extraction. That clearing up of the lens opacity without removal of the lens may occur in rare cases is also established, and, as Pyle says, with the maintenance of good general and ocular health, the chances of a cataract maturing are greatly lessened ; "but, beyond this, any reliable method of treating incipient cataract has yet to be demonstrated."

The popular impression that cataract may be escaped without operation is unduly fostered by the cases of incipient cataract which receive an unfavorable prognosis that the subsequent course of events fails to justify. G. E. de Schweinitz¹ gives a case of this kind where the patient had been told twelve years before he first saw her that she had cataract, and yet ten years after she had been under his observation her vision remained 6/XII and 6/XV.

De Schweinitz cites cases in which, by close attention to ocular and general health, the process was held in check for years, when without such attention there was every probability that it would have gone rapidly on to blindness. As regards electricity, massage, and various specific "absorbents," de Schweinitz has seen no benefit except possibly in one case of traumatic cataract, which appeared to improve under massage. In other cases the opacity has seemed to increase more rapidly under such treatment.

Much the same experience is reported by J. E. Weeks.² In the discussion following Weeks' paper W. H. Bates and G. O. Ring reported cases in which incipient cataract had disappeared and vision restored to normal under treatment directed to the general constitutional condition. A. Von Reuss³ reports two cases of the spontaneous disappearance of cataract, the capsule remaining intact. C. R. Hennicke⁴ records one in which restoration of vision followed a blow on the eye.

¹ Journal of the American Medical Association, December 8, 1900.

² Ibid., December 15, 1900.

³ Centralblatt f. prak. Augenheilkunde, February, 1900.

⁴ Klin. Monatsbl. f. Augenheilkunde, July, 1900.

But while these spontaneous cures are sometimes very striking and pleasing to the patient, they are probably far more dangerous than any operation that is now done to effect the same result. H. Gifford¹ reports four cases in which the spontaneous removal of the lens by dislocation, or partial absorption and dislocation, was followed by glaucoma causing complete blindness. E. Von Hippel² also reports a case of the kind in which the eyeball was enucleated and the lens capsule still found intact, the nucleus having been displaced in it, so as to leave the pupil partially clear.

H. D. Bruns³ reports a similar case, with rather characteristic history. After twenty-three years of blindness with cataract the patient began to see again. Within a year he came with the lens dislocated, increased tension, eye painful, and vision reduced to counting fingers at one foot.

It is probable that before we shall be able to accomplish much in the non-operative treatment of cataract there must be great improvement in the extent and definiteness of our knowledge regarding its pathology, and in this direction anomalous cases have especial interest. K. Kiriluchi⁴ reports an experimental study of the cataract produced by lightning stroke. He finds it associated with hyperæmia and degenerative changes in the iris, ciliary body, and choroid. The opacity commences at the equator of the lens and spreads most quickly in the posterior cortex. If the hyperæmia be slight and quickly recovered from the lens clears up. A. Pihl⁵ reports a case of rapid development of cataract in an unmarried woman, aged thirty-three years, after excessive hemorrhage. The history indicated that the cataract had developed within one week, but Pihl thinks it probable that a partial cataract had existed previously.

An interesting contribution regarding family cataract is made by J. Boulai,⁶ who operated on two sisters, aged twenty-seven and thirty-one years. On investigating the family history he found that the father had double cataract at sixty, the father's brother at sixty-two, and the father's sister and some cousins were also affected. The mother was free from cataract, but she had a sister with impaired vision and a cousin who probably also had cataract. Boulai's patients had a brother, aged forty-two years, who also had suffered from cataract.

Regeneration of the Crystalline Lens. This has been the subject of an experimental study by R. L. Randolph.⁷ He was able to confirm

¹ American Journal of Ophthalmology, October, 1900.

² Graefe's Archiv f. Ophthalmologie, August, 1900.

³ American Journal of Ophthalmology, February, 1901.

⁴ Graefe's Archiv f. Ophthalmologie, June, 1900.

⁵ Centralblatt f. prak. Augenheilkunde, January, 1900.

⁶ La Clinique Ophtalmologique, August, 1900.

⁷ Johns Hopkins Hospital Reports, vol. ix.

the reports of other observers that in the lower animals, after removal, regeneration of the lens takes place. Experimenting on young rabbits, twenty lenses were extracted and regeneration took place in eight cases. In four the regenerated lens differed in no respect from the lens that had been extracted. In other cases the new lens was incomplete, being represented by a ring or a horseshoe of lens substance in the periphery of the capsule. In the newt Randolph found that the lens was regenerated after its complete removal with the capsule, the new lens probably taking its origin from the iris.

Randolph is not sure that these phenomena have any conspicuous analogy in the history of cataract in human beings; but K. Baas¹ reports the case of a woman, aged thirty-seven years, in which discission was performed five times until finally a clear pupil, with vision of 2/vi, was retained. Twenty-five years later there was found in the pupil, hanging upon a shred of the capsule, a small rounded nodule, the edge of which gave the appearances characteristic of the edge of a dislocated crystalline lens.

Nutrition of the Lens. This has been investigated by J. Ovio² through experiments on the isolated lens, the enucleated eye, and on living rabbits and frogs. In these experiments diffusible and readily recognizable substances were employed, as potassium ferrocyanide, potassium iodide, and aniline colors. He found that these substances quickly made their appearance in the aqueous and vitreous humor when thrown into the general circulation; but they were found in the lens only after a considerably longer interval, and almost wholly confined to the superficial layers of the cortex. The aniline colors entered the lens most freely while the potassium ferrocyanide scarcely penetrated it at all. Ovio concludes that there are no special channels through which the lens is nourished, but that this is accomplished according to the general laws of osmosis.

DISCUSSION. In the discission of soft cataracts, P. Dunn³ advocates, before withdrawing the needle, to so turn it as to allow the aqueous to drain away. This, he thinks, will lessen the danger of increased tension following the operation. It will also favor the freest circulation of fluid through the eye, and thus a more rapid absorption. He thinks the rapid removal of lens débris after extraction may be due to the prolonged diminished tension.

Couching. There seems at present some disposition to revive this operation, to meet the indications presented by a few cases. H. Truc⁴ has employed it twice among 1500 cases, and urges that in addition to

¹ Abstract in *Ophthalmic Review*, April, 1900.

² *Annales d'Oculistique*, August, 1900.

³ *Lancet*, December, 1900.

⁴ *Transactions of Thirteenth International Medical Congress*, 1900.

the danger of expulsive hemorrhage after extraction, luxation of the lens, and especial risk of suppuration, as in the presence of dacryocystitis, are good reasons for resorting to it. E. Wassilieff and N. Andogsky¹ report an experimental study of this operation. They find that reclination is likely to be followed by grave complications that do not threaten the eye after extraction, and that it is rightly restricted to a very few cases in which the dangers from extraction are such that it should scarcely be considered.

In discussing Truc's paper Panas claimed good success in a large proportion of his cases. J. Hirschberg had seen a certain number of cases operated on in this manner in which the result was perfect. He thought it should not be completely abandoned. Dor, Gayet, and Valude all reported favorable experiences with the operation. Wicherkiewitz had seen ten cases operated on thus by his predecessor, and almost all the eyes were attacked with detachment of the retina or choroiditis.

Secondary cataract has been studied experimentally by W. H. Bates.² He concludes that in the rabbit the opacity is due not to the posterior capsule, but to new connective tissue formed in the pupil; that the formation of secondary cataract begins with the accumulation in the anterior chamber of coagulable fluid at the time of operation. From the coagulation fibrin appears, which later is replaced by connective tissue. He prevented secondary cataract in rabbits by quick operation, with closure of the wound with sutures and restoring the anterior chamber with physiological salt solution.

P. A. Callan³ says that the underlying principle in operations for secondary cataract should be to "cut, not attempt to tear" the membranes; and he thinks that the disasters which have attended these operations may be attributed to having operated too soon after the extraction, or to excessive traction on the capsule.

GLAUCOMA.

Glaucoma Excited by Mydriatics. For each new mydriatic that has been introduced the claim has been put forth that it had the advantage over all its predecessors in that it did not cause glaucoma. In a sense, no mydriatic causes glaucoma; it only provokes an outbreak in an eye that happens to be prepared for such a catastrophe. If put in all sorts of eyes such an outbreak would be produced in only one out of many thousands. Hence, it very naturally happens that a

¹ Klin. Monatsbl. f. Augenheilkunde, February, 1901.

² New York Medical Journal, July 7, 1900.

³ Journal of the American Medical Association, October 13, 1900.

new mydriatic may be widely tried and used for several months without producing glaucoma; but later, cases of glaucoma produced by it are reported. Euphthalmin, the mydriatic most recently proposed, has proved no exception to the rule. H. Knapp¹ reports a case in which a very rapid rise of tension followed its use to dilate the pupil for the purpose of diagnosis.

It ought to be understood that a mydriatic causes glaucoma simply by reason of its being a mydriatic, and not by some other property peculiar to certain members of the group. The dilatation of the pupil by thickening of the periphery of the iris blocks the outflow channels and increases the tension of the eyeball in those eyes in which such channels are abnormally narrowed. If the dilatation be prevented or overcome the mydriatic no longer causes the glaucoma. This is well illustrated in Knapp's case. The condition was recognized, eserine promptly instilled, and the attack at once relieved. A few days later iridectomy was done, and thus the patient was benefited rather than injured by the use of the drug; for, had not unmistakable evidence of glaucoma been in this way secured, the case might have gone on without efficient treatment until too late to save useful vision. Knapp states that he will not by this experience be deterred from the use of euphthalmin, since such an effect will probably be very rare, and the tension can be promptly reduced by the use of eserine.

The danger of aggravating glaucoma and rendering the patient permanently worse is proportioned to the length of time the mydriasis is permitted to continue. It is only for this reason that the briefer mydriatics are less dangerous than atropine. They cannot be considered safe in the sense that they should be used recklessly or that the patient should be allowed to pass from under observation before the pupil has again contracted.

C. H. B. Shears² reports a case of glaucoma following the use of homatropine a week before. Fortunately, a prompt iridectomy restored good vision. H. Gifford³ reports a case in which iridectomy was not done, and sight was permanently damaged. Gifford's patient was twenty-one years old.

The only case of glaucoma following the use of a mydriatic that I have encountered occurred in a woman, aged twenty-five years. Such cases illustrate, what cannot be too strongly emphasized, that it is not the age of the patient, but the glaucomatous predisposition of the eye that makes a mydriatic dangerous. Age is a factor only as it makes such a predisposition more common.

¹ Archives of Ophthalmology, May, 1900.

² Ophthalmic Review, March, 1900, p. 80.

³ Ophthalmic Record, July, 1900.

Shears and Gifford both advise the routine use of an eserine solution after the employment of homatropine. This seems to me unnecessary and in a large proportion of cases calculated to diminish the benefit to be derived from the homatropine. A more rational procedure is to carefully look for any evidence of increased tension, at the close of an examination under homatropine, and then to have the patient return for examination within two or three days. Where this is impracticable it may be worth while to employ eserine, if its influence will not be unfavorable or when there is the slightest reason to fear glaucoma; but careful ophthalmoscopical examination, and consideration of the case history from the point of view of possible glaucoma, are better than the indiscriminating routine use of a myotic.

In this matter of producing glaucoma, cocaine stands somewhat apart from other mydriatics. Beside producing dilatation of the pupil it can cause in the normal eye a very marked reduction in the intra-ocular tension. On this account it has been used in the treatment of glaucoma, commonly combined with a myotic to overcome its tendency to dilate the pupil. Gifford so used it in the case above cited and secured rapid reduction of the tension and relief from pain. But it must not be forgotten that the dilatation of the pupil by cocaine may produce increased tension of the eyeball.

J. Hinshelwood¹ reports a case in which he used cocaine to dilate the pupil because he feared homatropine might excite glaucoma; but a well-marked attack ensued, which was cut short by the use of eserine and permanent relief afforded by iridectomy. The patient, however, did not regain her previous normal vision. A similar case is reported by S. Snell,² in which the cocaine in 1 per cent. solution had been prescribed to relieve discomfort of the eye. In this case iridectomy restored normal vision. Probably the danger from cocaine is greater because in elderly people it is capable of producing a wider dilatation of the pupil than any of the "stronger" mydriatics, like atropine or hyoseyamin.

Other Causes of Glaucoma. Epidemic influenza has frequently been given as the cause of a first outbreak of glaucoma. G. E. de Schweinitz³ calls attention to the fact that, in a number of the cases, optic neuritis has preceded the rise of tension in the eyeball. He reports a case of bilateral retrobulbar neuritis followed by the gradual formation of an excavation of the optic nerve similar to that seen in chronic glaucoma, and suggests that an axial neuritis may be the starting-point of a glaucomatous excavation of the nerve-head.

Last year I discussed albuminuric retinitis as a factor in causing

¹ Ophthalmic Review, November, 1900.

² Ibid., February, 1900.

³ Ophthalmic Record, February, 1901.

glaucoma. Two new cases of the kind, with a study of the literature of the subject, are reported by E. Wehrli¹ and an additional case by D. Webster and E. S. Thomson.² In the latter case and in one of Wehrli's but one eye was affected. In all three cases the eyes became entirely blind and were enucleated on account of pain. Wehrli draws the practical conclusion that in cases of glaucoma, even without retinal changes, the possibility of kidney disease should be borne in mind, because the connection of these conditions is probably through the vascular alterations which attend chronic nephritis; and, while retinal changes are not always present, the vascular lesions are.

Cases of hemorrhagic glaucoma are reported by W. C. Posey and C. A. Oliver.³ In Posey's case the eye was enucleated for pain. Oliver reports three eyes out of eight saved for periods of four, six, and eight years by iridectomy performed slowly under general anæsthesia, with the patient's head somewhat elevated.

TREATMENT OF GLAUCOMA. The curative effect of *excision of the sympathetic* appears to rest upon such a different basis from that of iridectomy that the introduction of this new method has aroused a fresh interest in everything connected with glaucoma, and the literature relating to it has during the past year been especially voluminous.

T. Jonnesco,⁴ at the Thirteenth International Medical Congress, reported upon the twelve cases in which he had done sympathectomy, in all but two of which immediate and more or less lasting benefit was derived from the operation. In two of his earlier cases the relief has continued for over two years. All of these patients had previously submitted to iridectomy in one or both eyes without lasting benefit. In nearly all the glaucoma was chronic. Acuteness of vision was not restored, but the course of the disease was checked and the tension permanently reduced. In addition to his own cases Jonnesco has collected twenty-two cases operated upon in other countries, in twenty of which notable improvement of some duration was reported, while two were unsuccessful.

In a paper which followed Jonnesco's, Angelucci drew the distinction that sympathectomy was applicable only to chronic glaucoma, while iridectomy and the reopening of the iris angle (Vincentiis' operation) were suited for the acute forms. In discussing these papers Albertotti stated he had seen ten cases of sympathectomy, of which six had been followed for fifteen months. He believed that the operation would not replace iridectomy, but was suited for those particular cases

¹ Archives of Ophthalmology, March, 1900.

² New York Medical Journal, September 1, 1900.

³ Journal of the American Medical Association, December 8, 1900.

⁴ Transactions of Section on Ophthalmology.

in which iridectomy failed to control the disease. T. Axenfeld has resorted to sympathectomy in five cases which had subsequently been under observation from three to nine months. In none of them had acuteness of vision further diminished; in three it had improved and the visual field extended. He would still choose iridectomy for inflammatory glaucoma, and for simple glaucoma would do iridectomy and follow it with excision of the sympathetic. Lagrange called attention to the fact that in the dog the lowering of tension by removal of the sympathetic was only temporary.

Grunert¹ reports upon fifteen operations on the sympathetic for glaucoma, eleven being extirpation of the superior cervical ganglion and four resection of the sympathetic below the ganglion. In four cases of inflammatory glaucoma the results were very good in two, and in the other two the benefit was but slight. In one case of absolute glaucoma the increased tension and pain were relieved completely during the nine months the patient had been under observation. In another case the improvement was insignificant, and in a third enucleation had subsequently been necessary. In a case of simple glaucoma there was some improvement, but the eye was subsequently lost by an acute attack. In another case the improvement continued for four months. In hydrophthalmos the result had been improvement in one case and aggravation in another. Grunert collects sixty-two published cases, of which forty were benefited, fourteen remained unchanged, and eight were aggravated. Arranged in tabular form, these may help to throw a little light on the question of what forms of glaucoma are best suited to this method of treatment.

Variety.	Total.	Benefited.	Unchanged.	Aggravated.
Acute inflammatory	5	5	...	...
Chronic inflammatory	16	11	2	3
Inflammatory absolute	13	6	6	1
Simple	16	10	3	3
Simple absolute	8	6	1	1
Hydrophthalmos	4	2	1	1

While this showing is in the main good, it should not be accepted at quite its face value. As Grunert points out, these cases have been under observation too short a time to regard the results reported as final, and among those classed as benefited are a number in which the benefit was but slight.

We cannot yet regard the operation as more than a promising experiment for the relief of glaucoma. It ought to be tried where iridectomy has failed to help the case, or for those forms of glaucoma that are not usually benefited by iridectomy; and it may with propriety be tried

¹ Transactions of Heidelberg Ophthalmological Congress, 1900.

on other cases after proper explanations to the patient. Jonnesco's experience indicates that excision of the superior ganglia on both sides is more likely to effect a permanent reduction of tension than excision on one side only. This point should be tested by others.

The reports available do not all indicate how often double sympathectomy has been tried, but certainly in only a small minority of cases. How great the advantage of the double operation is one of the things yet to be determined.

Several authors make a strong point of the harmlessness of the operation. An operation that goes through the sheath of the great vessels in the neck to reach the sympathetic, where it lies almost in contact with the vertebra, cannot be regarded as absolutely devoid of danger; and in a short, thick neck it is an operation of considerable difficulty. The ptosis, increased hyperæmia of the eyeball, and increased lachrymation, one or all of which are pretty sure to follow, must not be entirely disregarded. They are symptoms which, existing alone, would lead many persons to seek relief. To cause such obvious troubles, without giving permanent relief from the glaucoma, is scarcely a desirable achievement. Sympathectomy is still something of a desperate remedy, properly resorted to for a desperate disease, but not to be lightly undertaken for those forms of glaucoma which abundant experience has shown are amenable to a properly performed iridectomy.

The treatment of chronic glaucoma was the subject of a notable discussion in the Section on Ophthalmology of the British Medical Association.¹ F. R. Cross, who opened the discussion, concludes that while a few eyes in which symptoms of chronic glaucoma have appeared may right themselves and a few are cured by myotics, we should, as a rule, advise an incision of the corneo-iritic angle, with or without the removal of a piece of iris, before the optic nerve is badly cupped and the tissues of the eyeball permanently damaged.

J. Hern said the one thing needful was an early diagnosis, for the earlier the operation the greater the chances for success. His practice was to do an iridectomy early, and later a peripheral incision, passing a knife back between the lens and the ciliary processes through the coloboma of the iridectomy. H. W. Dodd had tried sympathectomy with immediate benefit, but the case was too recent for final judgment. K. Grossmann preferred pilocarpine to eserine as a myotic, and found that electro-massage gave encouraging results. E. B. Bower found that the majority of cases eventually did badly after operation, but if sight could be retained for a few years only the value of the treatment could not be doubted. G. A. Berry had seen a case kept in

¹ British Medical Journal, October 6, 1900.

check for eighteen years by the regular use of pilocarpine; but when the disease entered the confirmed stage he performed iridectomy. He had seen cases ten to fifteen years after operation in which vision had not deteriorated. C. D. Marshall thought Hern's operation extremely dangerous. He could hardly imagine that a knife could be passed between the edge of the lens and the ciliary body without injuring one or the other. W. A. Brailey thought that in every case which resisted the action of myotics an iridectomy should be performed without delay, and in early cases he never had a bad result. If the fields were much contracted and the disk atrophied the disease progressed, as a rule, in spite of all treatment.

L. de Wecker¹ urges the performance of combined sclerotomy and iridectomy, the sclerotomy being performed one or two days before the excision of the iris. The sclerotomy he makes downward, and it may be small, amounting to little more than a puncture and counterpuncture, through the sclera. This, with massage, serves to reduce the tension, and he claims it renders safer the subsequent iridectomy. He states that cases too far advanced to be operated on safely by iridectomy can thus be successfully treated.

At the French Society of Ophthalmology, November 6, 1900, R. Jocs² urged that the value of iridectomy lay in opening a passage at the periphery of the anterior chamber. C. Abadie³ then expressed the opinion that the profession had abandoned the theory that glaucoma was due to obstruction of this region; but Rochon-Duvigneaud⁴ writes an elaborate paper defending the views that Abadie believed discarded, and W. Koster⁵ publishes an extensive experimental study of the filtration angle of the eye in young animals. By proving that no other possible channel exists, he demonstrates that the lymph from the ciliary body, and likewise the smaller quantity from the choroid, iris, and retina, must escape through the pupil or through the optic nerve, and that the cornea, except at its periphery, is impermeable.

E. A. Polya⁶ has examined anatomically twenty-three glaucomatous eyes, and in every case found pathological changes that tended to hinder the escape of fluid through the filtration angle. The most common change was closure of the angle, with inflammatory changes and adhesions of the epithelial surfaces of the iris and cornea. In the few cases in which the angle was found open the tissues in the filtration tract

¹ *Annales d'Oculistique*, November, 1900.

² *La Clinique Ophtalmologique*, November 25, 1900.

³ *Annales d'Oculistique*, November, 1900, p. 383.

⁴ *La Clinique Ophtalmologique*, January 25, 1901.

⁵ *Graefe's Archiv f. Ophthalmologie*, November, 1900.

⁶ *Ungarische Beiträge zur Augenheilkunde*, February, 1900.

were so altered as to render them apparently impermeable. To say that all the world has abandoned the theory of glaucoma based upon obstruction of the filtration angle shows a pre-eminent capacity for shutting one's eyes to the facts. That the changes in this part of the eye are the sole basis of glaucoma no one claims; but the discovery of the benefit to be derived from sympathectomy does not render obsolete the larger part of our previous knowledge of glaucoma.

Even for simple glaucoma, in which iridectomy has shown the least efficiency, a very good case may be made. Truc and Cauvin¹ report fourteen cases under observation from six months to five and a half years after iridectomy, and in every case vision in the better eye remained as good as it had been at the time of iridectomy.

Regman² reports five cases of simple chronic glaucoma in which he did iridectomy and the patients remained under observation from six to twelve years. In all of these the beneficial effect of the operation seemed demonstrated. Fage³ urges for absolute glaucoma optico-ciliary resection, not only to relieve pain but also to reduce the tension of the eyeball. He points out that it checks the secretion of the aqueous through section of the ciliary nerves, and that it favors the escape of fluid through the optic nerve and its sheath.

LACHRYMAL DISEASE.

Lachrymal Obstruction. The suggestions regarding the treatment of this condition keep close to the lines of treatment previously employed. F. Lagrange⁴ advocates electrolysis, and makes some good suggestions regarding apparatus and management of current. He employs a probe which is insulated to near the tip, so that the action of the current can be pretty well localized in the region of the stricture. The rheostat preferred is that of Bergonie, which consists essentially of a glass jar of water, into which tapering carbon points can be plunged to any desired depth. He states that the intensity of the current should be gradually increased and gradually diminished. Its maximum should rarely be over 5 milliampères, and the duration of application should not exceed five minutes. He finds that this method of treatment often gives excellent results, and that it increases notably the efficiency of probing. Where contracting scar-tissue is to be dealt with it may be necessary to use a current of 6 or 8 milliampères.

Steinitz⁵ has employed bougies of cocoa-butter, containing 5 per cent.

¹ Archives d'Ophthalmologie, January, 1900.

² Annales d'Oculistique, June, 1900.

³ Recueil d'Ophthalmologie, November, 1900.

⁴ Annales d'Oculistique, December, 1900.

⁵ Klinische Monatsbl. f. Augenheilkunde, May, 1900.

of protargol or 1 per cent. of colloidal silver (Crede). From an experience of six cases he regards this method of application as better than the use of injections to reduce the inflammation of the sac and duct. G. Schurenberg¹ has tested, in the Rostock Clinic, the practical value of Neustatter's method of injecting the lachrymal passages for diagnosis, for cleaning them prior to operations on the eyeball, and for the treatment of disease of the passages. He finds that the effects of such injections are very uncertain; that it is not a useful method in diagnosis, and in therapeutics it is not to be relied upon.

DISEASE OF THE LIDS.

Gangrene of the Lids. The eyelids are so vascular that we are accustomed to see them promptly recover from the most extensive injuries, but it should be borne in mind that gangrene or extensive sloughing of the lids may occur. Plaut² reports, from the Rostock Clinic, the case of a woman, aged forty-three years, who used for traumatic conjunctivitis cracked ice applied in a pig's bladder. This was kept on continuously for twenty-four hours. At the end of that time the lids were enormously swollen and livid in color. The lower lid was extensively necrosed; the upper lid to a lesser extent. In six weeks the resulting ulcers had been healed, but with narrowing of the palpebral fissure and ectropion. It is evident that the application of ice in this manner is decidedly more severe than the usual method of applying iced cloths at short intervals.

P. Steffens³ reports gangrene of the lids in an infant, aged six weeks, of good family history. A red spot had been noticed on the lower lid at birth, which increased in size, with swelling and redness of the lids. When first seen the nasal portion of both lids of the left eye exhibited a sharply limited lesion, 18 mm. wide by 14 mm. high, where the tissue had sloughed. Bacteriological examination showed the presence of diphtheria bacilli, and healing which had already begun went on more rapidly after the use of antitoxin.

Extensive destruction of the eyelids by malignant ulceration is reported by Kenneth Scott,⁴ in a man aged forty-five years. The ulceration had gone on for two months, but was stationary when the case was first seen. Although there was no decided history of syphilis, the case was treated with the inunctions of mercury and the ulcer rapidly healed, while the patient's general condition correspondingly improved.

¹ *Klinische Monatsbl f. Augenheilkunde* (Supplement), 1900.

² *Ibid.*, January, 1900.

³ *Ibid.*, May, 1900.

⁴ *Annals of Ophthalmology*, January, 1900.

Two cases of malignant pustule of the upper lid and brow are reported by E. Praun and F. Proschner.¹ They occurred in women, aged twenty-six and thirty-two years respectively, and seemed clearly due to inoculation of slight lesions by scratching or rubbing with the hand. In the second case there was quite extensive gangrene of the skin of the lid. In both the lesions were freely opened and the patients recovered.

Swelling of the Lids, with Albuminuria. T. Fisher² calls attention to swelling of the eyelids in connection with intermittent albuminuria. He reports six cases of such swelling of the lids in children from three to ten years of age. The swelling was quite variable or intermittent. In three, small amounts of albumin were found in the urine at some examinations and none at others. None of these patients gave a history of scarlet fever. In two cases of similar swelling of the lids no albumin was found in the urine at any time. In the sixth case it was constantly present. In none of these cases was œdema of the lower extremities or other parts noticed, except in the last, which, three years after it was first seen, was said to present swelling of the right hand and right foot at certain times. These children were none of them distinctly ill, but would all be described as weakly or delicate.

Operations for Entropion. For entropion of the lower lid, A. E. Ewing³ employs a modification of Green's operation, which makes an incision on the inner surface of the lid, parallel to the lid margin, through the tarsus. Ewing, after turning forward the liberated edge of the lid, introduces a suture first into the depth of the incision, then brings it out, carries it around the lid margin, and then beneath the skin for about 6 mm. He then places a firm roll of gauze upon this part of the skin and ties the suture over it, making a quill suture that necessarily everts the lid margin. Three such sutures are introduced at the centre and near the ends of the lid. After this the conjunctiva is stitched into the depths of the incision, so that one side of the incision is covered with epithelium.

J. E. Weeks,⁴ for entropion of the upper lid, grooves the outer surface of the cartilage and places a suture so as to draw the lid margin well up and fasten it to the upper portion of the cartilage. He removes a little skin of the lid, if this be redundant, but clears off the soft tissues down to the tarsus. If the entropion is decided he makes an intramarginal incision and places in it a strip of mucous membrane, 2 or 2½ mm. wide, removed from the lower lip. This strip is wedge-shaped, and when pressed into position requires no suture to retain it. H. Herbert⁵

¹ Centralblatt f. prak. Augenheilkunde, February, 1900.

² British Medical Journal, April 14, 1900.

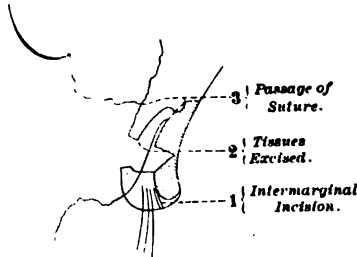
³ Transactions of the American Ophthalmological Society, 1900.

⁴ Loc. cit.

⁵ Ophthalmic Review, July, 1900.

employs a modified Snellen operation. He finds that the wedge taken from the tarsus should be as close to the free margin as possible. Its depth should always be sufficient to completely divide the tarsus. Its breadth must be proportioned to the degree of entropion existing. Not only the muscle, but a narrow strip of skin should be removed.

FIG. 79.



Weeks' operation for entropion of the lids.

Chalazion. I. Strzemieski¹ discusses the etiology and treatment of this affection from the basis of 119 cases encountered among 8000 patients. He finds it to be an adenitis of the meibomian glands, with consecutive periadenitis, and caused by various bacteria. The tubercle bacillus is probably the pathogenic organism in some, but not all cases. In the treatment he uses an ointment of 5 parts of iodine dissolved with the aid of 15 parts of potassium iodide in 20 parts of water and mixed with 20 parts of liquid petrolatum and 100 parts of lanolin. This is rubbed into the skin over the chalazion each evening and left on all night. Strzemieski reports that, excluding recent cases in which there was a good chance of spontaneous recovery, he used this method in 89 cases. Of these 5 recovered in two weeks, 9 in from fifteen to thirty days, 26 in from thirty to sixty days, 15 patients passed from observation and the result was not known, and in 25 the treatment had not effected a cure in three months, and they were then operated upon.

DISEASES OF THE ORBIT.

Exophthalmos and Enophthalmos. W. Edmunds² reported to the Ophthalmological Society of the United Kingdom a series of experiments on monkeys, which seem to demonstrate that enophthalmos may be produced by partial or complete excision of the thyroid gland by division of the cervical sympathetic or by the administration of cocaine, and that exophthalmos results from thyroid feeding. In discussing this paper J. B. Lawford referred to the case of a woman in whom

¹ Recueil d'Ophthalmologie, August, 1900.

² Transactions of the Ophthalmological Society of United Kindom, 1900.

thyroid feeding for myxœdema apparently produced exophthalmos. Four years later a repetition of the thyroid feeding for a return of the same symptoms again produced exophthalmos. In the same discussion Mackay instanced a case in which enophthalmos seemed to follow injury of the cervical sympathetic in the removal of enlarged glands.

A case of intermittent exophthalmos is reported by R. Hitschmann.¹ When the patient was quietly lying down the eyeball returned to about its normal position, but could be made to protrude as much as 15 mm. by compression of the jugular vein. Hitschmann's patient was a man, aged twenty-three years, and previously reported cases have been mostly in young persons. M. E. Mulder² reports a case in a man, aged thirty-seven years, a field laborer. At rest the eye took a position of enophthalmos, lying some 4 mm. deeper than its fellow; but by stooping, strong expiration, or compression of the jugular vein the condition was altered to one of equal or greater exophthalmos. R. Bickerton³ exhibited a charwoman, aged sixty-one years, in whom the eye had a normal position when standing, but became markedly protruded upon stooping. Compression of the jugular vein produced a similar effect, but less in degree. In all of these cases the right eye only was affected, and previously reported cases have been unilateral.

The mechanism of enophthalmos is discussed by W. T. Shoemaker,⁴ who finds the integrity of the orbital fascia necessary to the maintenance of the eye in its normal position. If this be impaired so that it can no longer resist the retractile force of the recti muscles, enophthalmos results. This impairment may be through paralysis of the smooth muscular fibres in the check ligaments, from rupture of the ligaments or other essential portions of the fascia, or through nutritional disturbances leading to atrophy or relaxation. The elasticity of the strictures may also permit of a spastic enophthalmos from simultaneous contraction of the four recti muscles. Shoemaker reports a case of traumatic enophthalmos, and another is reported by R. Daulnoy.⁵ In these cases the enophthalmos was noted, as usually happens, only after the inflammatory swelling had subsided.

A rare but most potent case of acute exophthalmos is *thrombosis of the cavernous sinus*. H. Knapp⁶ reports a case of non-infective thrombosis following injury and running a rather chronic course. At first it affected only the left side. Later, when there began to be evidences of

¹ Wiener klinische Wochenschrift, January 18, 1900.

² Klinische Monatsbl. f. Augenheilkunde, January, 1900.

³ Transactions of Ophthalmological Society of United Kingdom, May 3, 1900.

⁴ Annals of Ophthalmology, July, 1900.

⁵ La Clinique Ophtalmologique, March 25, 1900.

⁶ Transactions of the American Ophthalmological Society, 1900.

involvement of the right sinus, the left sinus was opened and cleared out by F. Hartley, and the symptoms about the right eye were relieved and its vision retained to the end. The patient died two and a half months later, of traumatic orbital sarcoma.¹

DISORDERS OF THE OCULAR MOVEMENTS.

Recurring Oculomotor Paralysis. Numerous cases of this disorder have been reported within the last year. One of these, observed by P. Morgan,² has some very interesting and suggestive features. The patient's mother died of some nervous disease, her father was an immoderate drinker, and a sister was epileptic. The patient herself was healthy except that at puberty she was attacked with severe headaches. At seventeen, when her menstrual period was due, she was greatly distressed and alarmed by the sudden death of her mother, and she suffered from hystero-epilepsy. She missed two periods, and at the time for the third had the first attack of oculomotor paralysis. Five weeks later she had the second attack coincident with very imperfect menstruation. Two months after that the whole thing was repeated, and so on until she had suffered eight attacks coincident with menstruation; but she improved until, for the last year, she had suffered only slight headaches at the menstrual period.

J. W. Stirling's patient³ was a girl, aged fourteen years, who had not menstruated and whose mother had been in an insane asylum four or five years. The girl had suffered from attacks of headache and vomiting since early childhood. The first drooping of the lid and double vision had followed diphtheria, when twelve years old. Since that she had had frequent attacks of headache and double vision, but without ptosis except on three occasions. Paralysis of accommodation and dilatation of the pupil had become fixed; the ptosis and diplopia were not.

A case of ophthalmoplegia interna associated with severe headache, in a woman, aged thirty-eight years, was reported by E. Troemmer.⁴ It was the right eye that was affected, but sometimes the pain was on the left side of the head. The attacks had commenced in the patient's twenty-first year. She had been free from them for five years, when they were brought on again by the shock of the sudden death of her mother. Her mother and sister had suffered from such headaches.

The patient of W. Seiffer⁵ was a man, aged forty-nine years, whose mother had been insane and whose father drank to excess. He suffered

¹ Archives of Ophthalmology, September, 1900.

² Annali di Ottalmologia, xxix., p. 16.

³ Ophthalmic Review, April, 1900.

⁴ Centralblatt f. Nervenheilk. u. Psychiatrie, October, 1899.

⁵ Berliner klinische Wochenschrift, July, 1900.

from recurring headaches from eight years of age, but only when thirty-eight did he begin to have the oculomotor paralysis, which was intermittent for four years and then became constant. His attacks occurred once a month quite regularly, being less severe if they came earlier and more severe if delayed.

Mobius¹ reports the case of a woman, aged thirty-one years, seen in her fifth attack, the interval having been in each instance two years. Previous attacks had lasted about two weeks each. This one was much improved after that length of time, but it was two months before she had recovered completely.

I. Strzeminski² reports the case of a girl, aged nineteen years, in whom the attacks had begun two years before. The oculomotor paralysis was at first complete, but ended in complete recovery. Four attacks had occurred. Strzeminski also discusses pretty thoroughly the cases previously reported. He inclines to the supposition that the attacks are congestive in character and affect the nucleus of the nerve. Cases like that of Troemmer, in which only the intra-ocular muscles were affected, point strongly in this direction. Then it is much easier to imagine that a recurring congestion could thus affect a nucleus rather than a nerve trunk. But no case has been recorded in which the nuclei have become successively involved, and the recorded autopsies have all shown lesions of the nerve trunk. The essential nature of the affection is still extremely obscure.

Retraction Movements of the Eyeball. In certain cases in which, by some congenital defect, there is a marked inability to turn the eye in certain directions; the attempt to execute the defective movement is attended with a notable retraction of the eyeball into the orbit. J. Wolff³ has reported five cases of this kind, and his report induced the publication of additional cases by A. N. Alling and H. Knapp. In Wolff's first case the right eye diverged, and any attempt to turn it in resulted in its being drawn back into the orbit fully 8 mm.; but on turning it toward the right it would move forward to a position of the same prominence as the left eye. On attempting to turn the eye toward the nose with forceps it appeared to be fixed on the outer side (Fig. 80). In the second case the right eye could not be turned out, but the attempt to look to the right caused it to advance slightly. Its movement toward the nose was less than normal, and the attempt to look that way (to the left) caused it to be retracted 3 or 4 mm. and to rotate downward. In the third case the left eye could not be rotated much outward, but the attempt was accompanied by an advance of the eye. Inward rota-

¹ *Deutsch Zeitschrift f. Nervenheilkunde*, vol. xvii., part 1.

² *Graefe's Archiv f. Ophthalmologie*, December, 1900.

³ *Archives of Ophthalmology*, May, 1900.

tion, which was rather less than normal, was attended with retraction of 3 mm. In the fourth and fifth cases, a sister and brother of the third, the attempts to turn the eyes in were also attended by retraction.

FIG. 80.



Failure to turn the left eye outward, but the attempt caused no retraction.
(ALLING'S case.)

FIG. 81.



Retraction of eyeball on attempting to turn left eye toward the nose. (ALLING'S case.)

In Alling's case (Fig. 81) the movement of retraction amounted to 10 mm., and occurred in the left eye on attempting to look to the right.

In Knapp's case also the left eye was retracted on attempting to turn it in, while it could be turned out very little beyond the median line.

Three of these cases were operated on. Alling found at the position for the external rectus nothing but tendinous tissue, while the tendon of the internus was very broad and thick. The operation lessened the mobility of the eye, but gave a satisfactory cosmetic result. Knapp found the tendon of the internus very broad and thick, and after dividing it the eye was still held by bands further back. On dividing these the eye immediately protruded. Knapp felt that in his case he encountered something like the retractor muscle that exists in some of the lower animals. Wolff operated on his third case and found the muscle normally inserted.

Wolff thinks these cases are best explained by supposing the eye immovably fixed at one side, so that the attempts to move it cause it to rotate around the point of fixation rather than about the usual centre of rotation. The movements of upward or downward rotation which accompanied retraction he thought indicated that the fixed point was below or above the plane of rotation.

A. Duane,¹ who examined one of Wolff's cases, however, thought that in it the upward rotation was due to a spasmodic action of the inferior oblique. He reports two other cases in which spasm of the inferior and of the superior oblique accompanied paralysis of the external rectus.

REFRACTION AND ACCOMMODATION.

Myopia. The interest in the surgical treatment of myopia by removal of the crystalline lens has in the last few years rather overshadowed that which attaches to the treatment of myopia with lenses, although the latter is really by far the more important matter. The cases of myopia in which operative treatment can properly be resorted to form a very small minority, and were lenses properly employed in all cases it is doubtful if any would come to operation.

H. Derby² strongly emphasizes the importance of the constant wearing of correcting lenses to check the increase of myopia in young persons where it inclines to be progressive. He reports some very striking cases in which the increase continued under careful supervision until correcting lenses were constantly worn, when it ceased entirely. This use of correcting lenses is not new, but it is not fully appreciated by many surgeons. This was illustrated in a discussion before the New York County Medical Association, February 18, 1901, in which widely

¹ Archives of Ophthalmology, September, 1900.

² Boston Medical and Surgical Journal, February 28, 1901.

opposed views were urged. It is also shown by the wide currency given, without adverse comment, to a suggestion made within the last year by L. Sarason.¹ He proposes that to prevent children from using their correcting lenses constantly they should be mounted so as to swing on a hinge from the top of the frame, falling into position so that the patient could look through them, when the head was erect, for distant vision, but swinging forward out of the line of sight when the head was bent forward for near work. Such a scheme conforms to the practice advocated by some of the older authorities with regard to the use of lenses for myopia; but I think it would be hard to conceive of a better plan for developing myopia up to the point where it will require operation and often end in complete blindness.

Periscopic Lenses. That meniscus lenses possess certain theoretical and practical advantages over other forms has long been understood in a way, but it is another instance of a generally imperfect appreciation of a truth having most important practical bearings. F. Ostwalt² has studied the subject by experiment and enforces its practical importance by photographs of a test-card through obliquely placed lenses showing to what extent obliquity of the lens prevents perfect focussing.

He concludes that for concave lenses the meniscus or the plano-concave is much to be preferred to the ordinary bi-concave form. The same holds good with reference to convex lenses of moderate strength. For the strongest convex lenses, used after cataract extraction, he prefers a lens in which the side turned from the eye shall be six times stronger than the side toward the eye. These strong lenses, to effect the most complete correction, almost always require a cylindrical surface. If this surface be turned toward the eye and the spherical from it the practical advantages of the periscopic lens will generally be secured.

Pseudo-accommodation. The apparent ability of aphakic eyes to see clearly at varying distances has from time to time given rise to the supposition that some sort of accommodation was possible apart from the generally recognized changes in the shape of the crystalline lens. O. Walter³ thinks that it is possible that in some cases the vitreous humor differs sufficiently from the aqueous in refractive index to cause a certain amount of refraction at the anterior surface of the vitreous, and that after the removal of the crystalline lens this anterior surface of the vitreous may be convex and somewhat under the influence of the ciliary muscle. T. Lohnstein⁴ points out, however, that there is little probability of such variation in the refractive index of the vitreous as

¹ Berliner klinische Wochenschrift, August 27, 1900.

² Graefe's Archiv f. Ophthalmologie, June, 1900.

³ Archives of Ophthalmology, November, 1900.

⁴ Loc. cit.

Walter supposes, and that even if it existed it could only be effective in cases in which the pupil was extremely small—1.5 mm. or less.

Another supposition to account for distinct vision at different distances has been that compression of the eyeball by the extra-ocular muscles could elongate it sufficiently to make the required alteration of focus. Careful observations have shown that there is no alteration of the corneal curvature by such compression, and there is no positive evidence of any elongation of the eyeball by voluntary contraction of these muscles. W. M. Beaumont,¹ however, thinks that the different degrees of visual acuteness found during cycloplegia in eyes presenting the same error of refraction indicate that the extra-ocular muscles have some influence in the way of accommodation. Beaumont, however, entirely ignores the fact that every dilated pupil presents in different parts of its area totally different degrees of refractive error; and while two eyes may obtain their best vision with the same correcting lens—the lens suited to the centre of the pupil of both—one eye in other parts of the pupil may be practically emmetropic and thus capable of almost full vision without any lens, while the other has no portion of the pupil through which rays can be approximately focussed on the retina. The whole case for pseudo-accommodation in the human eye is a very flimsy one, and will not be worth discussing further until reopened by evidence of an entirely different order.

¹ Ophthalmic Review, August, 1900.

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